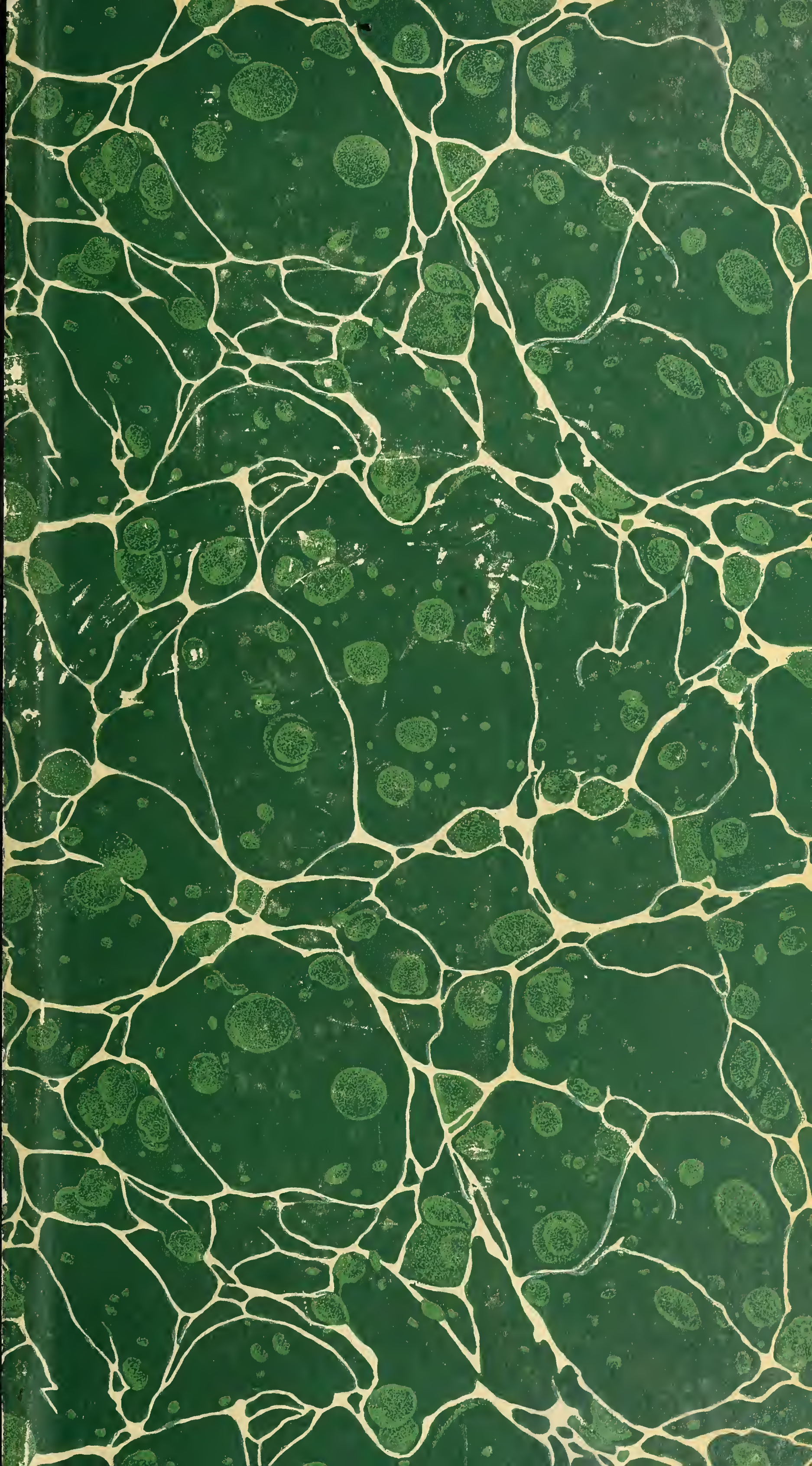

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXXII 1937

EDITED BY
J. R. de la TORRE-BUENO

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, *Editor*
G. P. ENGELHARDT CARL GEO. SIEPMANN

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Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

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§ Insects

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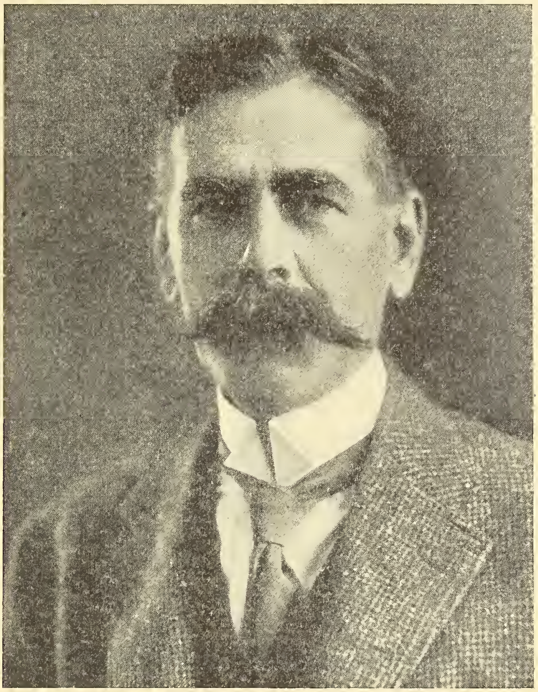

ROBERT PERCY DOW.

1865–1936.

By Geo. P. Engelhardt, Hartsdale, N. Y.

The accompanying illustration portrays an entomologist to whom much credit is due for the success and growth of the Brooklyn Entomological Society, following its reorganization in 1900.

Born in New York City and educated at the Greyback Seminary and Williams College, R. P. Dow joined his father's firm as a broker. Subsequently he became financial editor of the Commercial

MAY 1 1937

Advertiser and in 1905 established himself in a security business, continuing until his retirement and removal to California in 1918.

Those who have known R. P. Dow will remember him as an individual of unusual personality. Tall, slender, with flowing mustaches, a broad-rimmed hat at a rakish angle, he always was at ease, personifying his background of long American ancestry and of culture. With a leaning to classical literature and art, expanded on sojourns in Mediterranean countries, he combined a lifelong interest in the natural sciences. He had hobbies of various kinds and played them hard. He was an enthusiastic golfer, loved chess and was a founder of the Brooklyn Chess Club and a promoter of the annual international cable chess match. For nature in all its phases he had an inborn appreciation. Collections of butterflies and moths, started in boyhood, are still cared for and cherished by his sister, Miss Susan, at the Dow homestead in Claremont, N. H.

With such inclinations it needed only contacts made at the Brooklyn and at the New York Entomological Societies to set ablaze an ambition to make a name for himself in the entomological world. He became a member of both societies and in a remarkably short time acquired a very notable collection of Coleoptera, in large part by personal collecting. Long-neglected field meetings, under his leadership, resumed unsurpassed activity, bringing out at times 25 or more members, some even from the societies of Newark and Philadelphia. Such gatherings, arriving or departing from railroad stations were apt to arouse the curiosity and astonishment of onlookers. Dressed in old clothes, battered hats, long boots or puttees and carrying all sorts of queer-looking collecting paraphernalia, it certainly was an odd-looking assemblage. Dow in the vanguard, utterly oblivious of public impressions, carried the eight-foot pole of his butterfly net across the shoulder, the three-foot bag hanging behind and the rest of the party straggling along. He loved to repeat the remark of a bystander, overheard on a trip to Overbrook, N. J., a place noted for the insane asylum on top of a hill above the railroad station. "There goes a bunch of lunatics," was the remark.

The Bulletin of the Brooklyn Entomological Society more than doubled in volume, as well as in circulation, during Mr. Dow's editorship, 1915–1918. His contributions to entomological literature, it will be noted from the titles of the appended list, are more in the nature of historical reviews and philosophical contemplations, than pure research. Leng's Catalogue of the Coleoptera cites only one beetle named by him: *Cicindela obsoleta* form *anita*. His collection, ultimately, was acquired by Wm. T. Davis. His papers, usually read before publication at the Brooklyn or at the

New York society, always were anticipated with interest. His delivery was slow, droll, interspersed with drawls and chuckles, imparting to his audience his own enjoyment of the occasion, as well as his keen sense of humor. In these days, when entomological meetings have become so cut and dried, one misses the stimulation of a man like Dow. The niche, so peculiarly his own, has not been filled.

In California, R. P. Dow roamed for a spell, doing little, if any, entomological work. Then he built himself a home. Like a swallow's nest under the eaves of a precipice it nestled high up against a steep hillside overlooking picturesque Laguna Beach and the boundless ocean beyond. He had a flower garden and orchard trees, a lily pond and animal friends of all sorts, furry, feathered and scaly, which fed out of his hand. Much of his time was consumed in writing the genealogy of the clan of the Dows. A tremendous job, judging by his mansucript stacked several feet high. Not all of the Dow ancestors came to a peaceful end. This was a source of especial satisfaction to him. The genealogy appeared in book form not long ago.

On a visit late this summer we found R. P. Dow in a hospital, a very sick man. The end was near and he knew it. Was he downhearted, discouraged? Not a bit. His life had been full to the brim. Pleasures, sorrows, accomplishments, he had them all in full measure. What more could be asked for? On November 11th he passed away, peacefully, content.

On our records let us inscribe his characteristic message:

"Yours fideliter, R. P. Dow."

PAPERS BY R. P. DOW.

Bulletin of the Brooklyn Entomological Society.

The Makers of Coleopterous Species. Vol. 8, No. 3, pp. 37–41; No. 4, pp. 51–55.
The Rector of Barham and His Times. Vol. 8, No. 5, pp. 68–74.
Rare or New Coleoptera from California. Vol. 8, No. 5, pp. 77–78.
Work and Times of Dr. Harris. Vol. 8, No. 7, pp. 106–110.
Early French Coleopterists. Vol. 9, No. 1, pp. 6–13; No. 2, pp. 37–42.
The Russian Masters of Coleoptera. Vol. 9, No. 5, pp. 96–101.
Sweet Singers of Pallas Athene. Vol. 10, No. 3, pp. 54–59.
First Insects in the World. Vol. 10, No. 4, pp. 69–73.
The Land of the Rose Apple. Vol. 10, No. 5, pp. 94–100.

The Weaver of the Web. Vol. 11, No. 1, pp. 6–10.
Testimony of the Tombs. Vol. 11, No. 2, pp. 25–33.
Translations from the Persian (Poems). Vol. 11, No. 4, p. 84.
Studies in the Old Testament (The Vengeful Brood of Lilith and Samuel). Vol. 12, No. 1, pp. 1–9; No. 3, pp. 64–69.
The Grasshoppers of the Old Testament. Vol. 13, No. 2, pp. 25–30.
Old Testament Insects. Vol. 13, No. 4, pp. 90–93.

EDITOR DOW.

"Torre! Torre! Torre! You never use *one* word where two would do as well!" And the heartless blue pencil would tear through some fruity expression.

What Dow said about absent authors when he read their best efforts and ruthlessly slaughtered them, only the Recording Angel knows—and I hope he lost his pencil!

Surrounded by his books, his collection, by serried ranks of sets of the BULLETIN and cabinets and safe containing his business data, Dow sat enthroned at his desk, flanked by a typewriter as a guard of honor. There, in his little office in the old Mills Building, in the very center of the financial ganglion of New York, he elaborated those fascinating *jeux d'esprit* about The Testimony of the Tombs, The Brood of Lilith. Here, his imagination, enriched by much esoteric reading, led him into curious byways of entomology.

And so I knew Dow—caustic, kindly, "full of strange oaths and bearded like a pard."

And he is now gone into the great certitude!

Withal, Robert Percy Dow was a MAN.

J. R. T.–B.

THE THIRD NEARTIC SPECIES OF NITELA, WITH REMARKS ON THE GENERA TENILA BRÈTHES AND RHINONITELA WILLIAMS (HYMENOPTERA: SPHECIDAE).

By V. S. L. Pate, Ithaca, N. Y.

During the past summer of 1936 at Woodhaven, Long Island, Mr. William George Bodenstein discovered a number of small aculeates nesting in the trunk of a dead cherry tree in the yard of his neighbor, Mr. J. C. Linz. Upon examination these were found to be *Stigmus americanus* Packard, *Trypoxylon frigidum* Smith, and a new species of the rather rare genus *Nitela* which is described herewith, bringing the number of Nearctic species of this genus now known to three. Hovering about the nesting holes in the dead cherry tree, Mr. Bodenstein informs me, were a number of the small parasitic Chrysid wasp, *Chrysidea verticalis* Patton.

Nitela cerasicola n. sp.[1]

♀. 4 mm. long. Entirely black, except the apices of the mandibles which are dark red, and the tibial spurs which are testaceous. Clothed with a sparse, pale, short pubescence.

Wings clear hyaline, veins dark brown; forewing with the submarginal cell subrectangular, twice as long as broad, the recurrent nervure received by the cubitus distinctly before the transverse cubital nervure, the cubitus prolonged beyond the transverse cubital nervure as a short but distinct spur; marginal cell narrowly rounded apically and weakly appendiculate there.

Head shining to subopaque, face, clypeus and vertex closely and finely punctate, temples aciculate; clypeus rounded out and with a shining, impunctate subbevelate portion medioapically, laterad of which on each side is a blunt tooth; clypeus and front for the length of the scape with a cristate median longitudinal keel on each side of which there is a rather deep concave scapal basin; antennal insertions about twice as far from each other as from the nearest eye margin, pedicel as long as the first segment of flagellum, second and third flagellar articles subequal in length to the first and individually longer than any of the succeeding flagellar segments; eyes convergent toward the vertex and very finely and obscurely puberulent; mandibles entire beneath, simple apically; malar space evident, about one-third the length of the scape; ocellocular line about one-third the postocellar line.

---

[1] From *cerasus,* cherry tree, and *colo,* to inhabit, in allusion to its nesting habits.

Thorax shining, with puncturation similar to that of face; pronotum rounded anteriorly, not transversely carinate, dorsal surface with a deep transverse, minutely foveolate sulcus interrupted medially by a raised V-shaped backward production of the anterior dorsal surface; mesonotum with the lateral edges margined with a row of small foveolae, but the anterior lateral corners without trigonal foveolate areas as in *N. virginiensis,* the posterior margin with a distinct row of foveolae; mesopleura with the episternal suture, the sternauli, and an impressed furrow just before and parallel to the meso-metapleural suture foveolate, the prepectus and mesosternum subopaque, and finely punctate, the mesopleura behind the episternal suture and above the sternauli shining, polished and impunctate, discally with a deep median pit; metapleura ankylosed with the propodeum and shining, highly polished and impunctate; propodeum shining, the dorsal face traversed by well separated, parallel longitudinal carinulae connected irregularly with one another by transverse carinulae; lateral faces of propodeum with irregular parallel longitudinal carinulae; posterior face minutely irregularly clathrately rugulose, medially with a narrow, deep elongate subobcuneate fovea, laterally at the junction with the lateral faces, carinate.

Abdomen shining, highly polished, and with a very fine scattered puncturation; pygidial area wanting.

♂. Unknown.

Holotype.—♀, 8720 Ninety-sixth Street, Woodhaven, Long Island, New York, August 29, 1936 (W. G. Bodenstein; nesting in trunk of dead cherry tree).

This species seems to be somewhat intermediate between *Nitela virginiensis* Rohwer and *N. floridana* Pate, agreeing with the latter by possessing an elongate subrectangular submarginal cell and in the finely puberulent eyes but differing from it by the transversely sulcate pronotum, the sculpturing of the head and thorax, and the color of the legs. On the other hand, the general habitus of *N. cerasicola* is quite similar to *N. virginiensis* but the pronotum is not transversely carinate as in the species, nor does the mesonotum have the anterior lateral corners provided with a trigonal foveolate area and the hind margin medially with a radiating fan of carinulae that are so characteristic of *N. virginiensis.*

Until further material is forthcoming, the following key will serve to distinguish the known Nearctic species of *Nitela.* As yet, no males are known, but they should be separable upon the characters given below.

1. Pronotum transversely carinate anteriorly; mesonotum at each anterior lateral corner with a trigonal foveolate area, posterior margin medially with a fan of radiating carinulae; eyes bare; submarginal cell rhomboidal .... *virginiensis* Rohwer.
   Pronotum rounded anteriorly, not transversely carinate; mesonotum not so constructed; eyes microscopically puberulent; submarginal cell rectangular 2
2. Pronotum flat dorsally, not transversely sulcate; mesonotum with posterior margin simple, not foveolate; head and thorax microscopically shagreened; clypeus and front not keeled; cubitus of fore wing without a stump distally; legs fulvous; southern species. .... *floridana* Pate.
   Pronotum with a transverse, minutely foveolate sulcus dorsally; mesonotum with posterior margin foveolate; head and thorax finely punctate; clypeus and front with a median longitudinal cristate keel; cubitus of fore wing with a stump distally; legs black; northern species .... **cerasicola** n. sp.

In 1928 Williams established the genus *Rhinonitela*[2] for the reception of two species from the Philippines and British Guiana, differentiating it from *Nitela* by the presence of a median longitudinal cristate keel on the clypeus and front, by the mandibles being simple and edentate apically, and by the eyes being hairy. His diagnosis, however, agrees very well with Ducke's description of *Nitela amazonica*[3] upon which Brèthes in 1913 based his genus *Tenila,*[4] and although I have seen no authentic material of either of these, I believe that the two groups are congeneric in all probability. *Nitela cerasicola* and, in some measure, *N. floridana* apparently exhibit the characteristics of this genus, and if they should eventually prove to be congeneric with *Tenila,* I do not think that this group may be accorded the rank of a discrete genus—indeed, it is doubtful if *Tenila* may even be considered a good subgenus. However, until I have had an opportunity to examine material of *Tenila* and *Rhinonitela,* I am unable to settle this question satisfactorily. For the present, consequently, I prefer to allocate *cerasicola* and *floridana* to *Nitela.*

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[2] Exp. Sta., Hawaiian Sugar Planters' Assn., Ent. Ser., Bull. 19, p. 97 (1928).

[3] Verh. Zool.-Bot. Ges., Wien, LIII, p. 269 (1903).

[4] An. Mus. Nac. Hist. Nat. Buenos Aires, XXIV, p. 153 (1913).

AN ANNOTATED LIST OF INSECTS FOUND IN THE BARK AND WOOD OF ULMUS AMERICANA L. IN NEW YORK STATE.*

By L. L. Pechuman, Cornell University, Ithaca, New York.

In the course of work on the Dutch Elm Disease conducted by the Departments of Entomology and Plant Pathology at Cornell University, it was thought advisable to make a rather complete study of the various species of insects found in elm with especial reference to their potential ability to transmit the organism of the Dutch Elm Disease.

This work was begun in 1934 by Dr. P. A. Readio and has continued under his direction and later that of Dr. D. L. Collins until the present time. Mr. Henry Dietrich and Mr. C. H. Martin have also made numerous observations on elm insects. This paper is, therefore, more or less a compilation of observations made by all members of the Dutch Elm Disease Investigation staff, and all should receive equal credit.

In addition to field collections many samples of elm wood were collected both within and without the Dutch Elm Disease area. These samples were caged and a record kept of all emergence from each sample. In this way much ecological and biological information was obtained, only a small portion of which is included in the following list. All records of species from elm in this paper are based on observations made during the course of the work.

In a project of this sort involving a large number of different groups of insects, the cooperation of specialists in the various groups is of primary importance. Without exception this cooperation was willingly given. Special acknowledgment is due Mr. C. F. W. Muesebeck and Mr. Henry Townes who determined the Ichneumonoidea, and to Mr. A. B. Gahan who determined the Chalcidoidea, to Dr. W. T. M. Forbes who determined the Lepidoptera, and to Dr. C. H. Curran who determined most of the Diptera. Acknowledgment to the many other specialists who identified specimens is given throughout the list.

Most of the laboratory work involved was done at the Boyce Thompson Institute for Plant Research at Yonkers, N. Y., and all cooperation received from that institution is greatly appreciated.

All species not given as members of the insect fauna of New

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* Abstract of a thesis submitted as a partial requirement for the degree of Master of Science.

York State in "A List of the Insects of New York" (Leonard, Cornell Mem. 101, 1928) are indicated by an asterisk (*).

COLEOPTERA.

(All Coleoptera determined by Mr. Henry Dietrich unless otherwise noted.)

STAPHYLINIDAE.

Paederinae.

Members of this subfamily are frequently encountered under the moist decaying bark of dead elms.

Tachyporinae.

Conosoma opicus (Say). This species is fairly common under moist bark.

Conosoma crassus (Grav.). This species is found in the same situations as *C. opicus,* but is usually less common.

HISTERIDAE.

Histrinae.

Platysoma depressum Lec. Found under moist bark.

Platysoma coarctatum Lec. A very common species under elm bark where it is usually associated with *Saperda tridentata* or various Scolytids. Usually it is found in the well-developed larval galleries of wood-boring insects, but it has occasionally been noted in the fresh maternal tunnels of entering *Hylurgopinus rufipes.*

Paromalus aequalis Say. Under the moist bark of dead elms.

Isomalus bistriatus Er. Under the moist bark of dead elms.

MELYDRIDAE.

Malachiinae.

Attalus sp. One specimen from a small dry branch of a dying elm.

CLERIDAE.

Clerinae.

Enoclerus nigripes Say. A common predator of *Hylurgopinus rufipes.* The adults frequent elm logs where they prey on entering or emerging *H. rufipes,* and the larvae feed on the larvae and pupae of that species. The life cycle corresponds to that of *H. rufipes,* and it is doubtless of great importance in keeping that species in check.

Hydnocera unifasciata Say. Much less common than *E. nigripes,* but of similar habits.

PYROCHROIDAE.

Dendroides bicolor Newn. The larvae of this species are quite abundant under the moist bark of dead and decaying elms. The adult beetles, however, oviposit in freshly cut wood.

ELATERIDAE.

PYROPHORINAE.

Alaus oculatus (L.). The larvae of this beetle are occasionally found in decaying elm logs. It is probably predacious on associated insects. The larvae of *Alobates pennsylvanica* and *Synchroa punctata* are frequently found with it.

BUPRESTIDAE.

Dicerca divaricata (Say). One specimen was reared from a dead elm branch.

Anthaxia viridicornis (Say). A rather common borer in the smaller branches of elm. In most cases this species was in association with *A. viridifrons* Gory. These two so-called species were on several occasions found mating and, therefore, all records are grouped under Say's species.

Chrysobothris femorata (Oliv.). The larvae of this species were fairly common in freshly cut elm logs in several localities.

OSTOMIDAE.

Tenebroides bimaculatus (Melsh.). Occasionally found under bark.

Tenebroides corticalis (Melsh.). Common under elm bark, both freshly cut and well decayed. Both adults and larvae are probably predators of wood-boring insects.

CUCUJIDAE.

Silvanus bidentatus (Fab.). A few specimens under the moist bark of a dead elm.

Silvanus imbellis Lec. Under bark of an elm log.

Cucujus clavipes Fab. Adults and larvae of this species are frequently quite abundant under the bark of dead and dying elms.

Laemophloeus fasciatus Melsh. Found in small numbers under elm bark.

Laemophloeus liquidus Csy. Very common under decaying elm bark. It is occasionally found in the tunnels of bark beetles in recently killed wood.

COLYDIIDAE.

Synchita fuliginosa Melsh. One specimen reared from an elm log. Yonkers, N. Y., July 30, 1935.

Eucicones marginalis (Melsh.). One specimen reared from an elm log. Pelham Bay Park, N. Y. City, June 30, 1936.

Bothrideres geminatus (Say). One specimen under elm bark. Tarrytown, N. Y., August 8, 1936.

TENEBRIONIDAE.

Diaperinae.

Diaperis maculata Oliv. Adults of this species were found under the bark of a dead elm at Ithaca, N. Y.

Tenebrioninae.

Alobates pennsylvanica (DeG.). Adults are frequently found under the bark of dead elms; the larvae are found in similar situations and in well-decayed wood.

Strongyliinae.

Strongylium tenuicolle Say. One specimen was reared from an elm log. Yonkers, N. Y., July 20, 1935.

MELANDRYIDAE.

Synchroa punctata.. Newn. Common in dead elm in which the bark is still in close contact with the wood. The adults usually oviposit in the living wood of dying trees or in freshly cut wood, but the wood is invariably well decayed by the time the larvae are full grown. The larvae are apparently scavengers.

ANOBIIDAE.

Anobiinae.

Ptilinus ruficornis Say. Reared in considerable numbers from a dead branch of a living elm.

CERAMBYCIDAE.

Prioninae.

Parandra brunnea (Fab.). The larvae of this species are occasionally found in elm.

Cerambycinae.

Physocnemum brevilineum (Say). Occasionally reared from elm logs collected in various localities.

Xylotrechus colonus (Fab.). Fairly common in weakened elms.

The tunnels are largely in the bark, scarcely scoring the wood. All emergence took place in early June.

Neoclytus acuminatus (Fab.). A common insect in weakened trees and freshly cut elm wood. It sometimes bores between the bark and wood, but more frequently its tunnels penetrate deeply into the wood.

Anthoboscus ruricola (Oliv.). Observed ovipositing on elm logs in May at Patterson, N. Y. (C. H. Martin.)

LAMIINAE.

Psapharochrus quadrigibbus (Say). Observed ovipositing on elm logs at Patterson, N. Y. (C. H. Martin.)

Astylopsis macula (Say). A few specimens were reared from elm logs.

Leiopus variegatus (Hald.). A few specimens were reared from elm in May and June, 1935.

Graphisurus fasciata (DeG.). One specimen reared from an elm log. Tarrytown, N. Y., Sept. 16, 1936.

Saperda tridentata Oliv. One of the most abundant of all elm insects. Although the adults are not commonly met with in the field, all dying trees examined contained large numbers of *S. tridentata* larvae. Some members of a single brood of this species complete their life cycle in one year while other members of the same brood take two and possibly three years to complete their development. Many parasites were reared in association with *S. tridentata.*

Oberea tripunctata (Swed.). Larvae of this species were found boring on two occasions in the small twigs of elm, causing the tip to break over and the leaves to wither.

CURCULIONIDAE.

CURCULIONINAE.

Magdalis pandura Say. Emerged in small numbers from elm wood collected at Crugers, N. Y. Emergence took place during the last week in May.

Magdalis barbita Say. Rather common in smaller elm branches, but is occasionally found in the larger branches or even in the trunk. It is frequently found in association with *M. armicollis.*

Magdalis armicollis Say. This species is more common than *M. barbita* and sometimes does considerable damage to elms. Most of the emergence takes place in June, but occasional specimens are found throughout the summer. The males of this species are frequently completely black and difficult to distinguish from *M. barbita.*

Conotrachelus anaglypticus (Say). Occasionally found on the foliage and branches of elm. The larvae mine in the cambium around the edges of wounds.

Cryptorhynchus obtentus (Hbst.). A few specimens of this species were reared from elm branches.

COSSONINAE.

Acamptus rigidus Lec. One specimen of this strange Cossonid emerged on June 5, 1936, from elm wood collected at Crown Point, N. Y.

Cossonus impressifrons Boh. Under the bark of a dead elm at Yonkers. N. Y.

Pentarthrinus parvicollis Csy. This species was quite numerous in a dead elm stub collected at Tuckahoe, N. Y., September 2, 1936.

Stenoscelis brevis (Boh.). This species is quite common in dead elms through which it tunnels in all directions.

SCOLYTIDAE.

SCOLYTINAE.

* *Scolytus multistriatus* (Marsh.). This imported species is abundant in the New York City area and for a considerable distance up the Hudson River Valley. Its habit of feeding in the twig crotches of healthy elms makes it of primary importance in the dissemination of the Dutch Elm Disease organism. It prefers to breed in weakened or recently cut elms.

Scolytus sulcatus Lec. This species was formerly thought to be very rare, but it has been reared from elm in many localities in New York State. It is, however, not a common insect. Like *S. multistriatus* it also feeds in twig crotches, and is, therefore, of potential importance in the spread of the Dutch Elm Disease organism.

HYLESININAE.

Hylurgopinus rufipes (Eich.). This species is quite common in New York State wherever elms are found. It prefers to breed in dead trees, the dead and dying portions of living trees, and in felled wood that has been cut some time.

IPINAE.

Monarthrum mali (Fitch). This species was found entering elm logs in large numbers at Patterson, N. Y., on May 8, 1936. (C. H. Martin.)

Xyloterinus politus (Say). Found boring in elm at Varna, N. Y., on September 29, 1936. (H. Dietrich.)

Anisandrus minor Sw. This species is quite common in elm logs. It seems to prefer rather freshly cut wood.

HYMENOPTERA.

XIPHYDRIIDAE.

Xiphydria sp. This species, which is probably *X. tibialis* Say, was reared in moderate numbers from elm collected in various parts of New York State. The larvae bore through the solid wood of dead and dying trees.

Xiphydria hicoriae Roh. (Det. D. Ries.) This borer was fairly common in elm collected at Haverstraw and Nyack, N. Y. Its habits in boring are similar to the preceding species. Emergence took place during the last of July and the first of August.

SIRICIDAE.

Tremicinae.

Tremex columba L. This species has been reared from elm and has been observed on several occasions ovipositing in large numbers on dying elms.

TENTHREDINIDAE.

Allantinae.

Sawfly larvae of this subfamily were collected about one centimeter beneath the surface of a dead elm branch. Dr. H. H. Ross in correspondence states that the larvae of this subfamily feed on herbaceous plants and when full grown bore into twigs, bark, apples, etc.

Strongylogastroidea unicincta (Nort.). (Det. W. Middlekauff.) One specimen from an elm log.

Selandriinae.

Strongylogaster politus Cress. (Det. W. Middlekauff.) Two specimens were reared from elm wood, May 3 and 5, 1936. This species feeds on the fern *Pteris aquilina,* but it has also been reared from the pith of elder and sumach.

BRACONIDAE.

Coenocoeliinae.

Coenocoelius saperdae (Ashm.). (Det. Townes.) This species is a very common parasite of *Saperda tridentata* and was reared in large numbers. It emerged throughout the season but was most common in June and July. Mr. Townes states that the specimen of *Coenocoelius rugosus* Prov. recorded as a parasite of *S. tridentata* in the list of New York insects (Leonard, 1928) is also *C. saperdae.*

Coenocoelius erythrogaster (Roh). (Det. Muesebeck as *Capitonius erythrogastra.*) One specimen of this insect was reared from elm. Yonkers. N. Y., June 23, 1936.

VIPIINAE.

* *Atanycolus ulmicola* Vier. (Det. Muesebeck.) This insect is also a common parasite of *S. tridentata* although less common than *C. saperdae.* It appeared in numbers in the spring and fall, but is only rarely seen in midsummer.

SPATHIINAE.

Spathius canadensis Ashm. (Det. Muesebeck.) This species was the most abundant of all parasites reared from elm. It was reared as a parasite of *Hylurgopinus rufipes, Magdalis barbita,* and *Magdalis armicollis.* It probably also attacks *Scolytus multistriatus* and possibly *Saperda tridentata.*

Spathius sp. One specimen from elm, Yonkers, N. Y., May 29, 1935.

HORMIINAE.

* *Heterospilus* n. sp. (Det. Muesebeck.) The larvae of this species are external parasites of *Saperda tridentata.* The adults appeared in fair numbers during the last of August and the first of September.

SIGALPHINAE.

Triaspis curculionis (Fitch). (Det. Muesebeck.) One specimen of this insect was reared from elm wood.

Chelonus sp. A few specimens were reared from elm.

MICROGASTERINAE.

Apanteles sp. 1. One specimen from elm.

Apanteles sp. 2. One specimen from elm. Both this and the preceding were probably parasitic on a Lepidopterous bark feeder.

BLACINAE.

Eubazidon magdali (Cress.). (Det. Muesebeck.) A common parasite of *Magdalis barbita* and *M. armicollis.* Its emergence like that of its hosts is in the spring, but occasional specimens are found throughout the summer and fall.

Eubadizon sp. (Det. Muesebeck.) Occasional specimens were reared from elm at various times.

HELCONINAE.

Helconidea albitarsis (Cress.). (Det. Townes.) Several specimens of this parasite emerged from elm wood in May.

ALYSIINAE.

* *Synaldis* sp. (Det. Muesebeck.) One specimen from elm.

ICHNEUMONIDAE.

CRYPTINAE.

* *Chaeretymma* sp. (Det. F. D. DeGant.) One specimen reared from elm wood on May 20, 1936. Mr. DeGant states that this may be the male of *C. kennedyi* DeGant MS.

* *Chaeretymma* n. sp. One specimen of this new species, which is to be described by Mr. DeGant, was reared from elm wood on May 27, 1936.

* *Chaeretymma zingara* DeGant MS. (Det. F. D. DeGant.) One specimen of this species was foound dead in the larval tunnel of *Dicerca divaricata* in elm at Mt. Ivy, New York. Another specimen of *Chaeretymma* was found with *C. zingara,* but was so mutilated that identification was impossible.

ICHNEUMONINAE.

Asphragis sp. (Det. R. A. Cushman.)

Theronia fulvescens (Cress.). (Det. Townes.) One specimen from elm, Yonkers, N. Y., May 31, 1935. It was not determined on what insect this species was parasitic.

Megarhyssa sp. Larvae of this genus were collected parasitizing *Tremex columba* in elm. (Readio and Dietrich.)

Xorides albopictus (Cress.). (Det. Townes.) A fairly common parasite of *Saperda tridentata.* Most of its emergence is in May and June.

* *Xorides calidus* Prov. (Det. Townes.) A few specimens of this species were reared from elm.

Deuteroxorides caryae (Harr.). (Det. Townes.) A few specimens of this species emerged the last week in August and the first week in September. It is apparently parasitic on *Saperda tridentata.*

Odontomerus vicinus Cress. (Det. Townes.) One specimen of this species was found to be parasitic on *Dicerca divaricata* in elm.

OPHIONINAE.

* *Trichomma reticulatum* Davis. (Det. Cushman.) One specimen was reared from elm, Yonkers, N. Y., May 8, 1935.

CYNIPIDAE.

Ibaliinae.

Ibalia maculipennis Hald. This unusual insect was observed in numbers ovipositing in elm infested with *Tremex columba* and other elm borers on June 28, 1935. (Readio and Dietrich.)

CHALCIDAE.

* *Trigonura* n. sp. (Det. Gahan.) This species is apparently parasitic on *Magdalis barbita* and *M. armicollis* as it was reared in large numbers from wood containing only those insects. Most of the emergence was in May and June.

* *Trigonura* n. sp. (Det. Gahan.) A single specimen of a new species of *Trigonura* different from the preceding was reared from elm wood collected at Crown Point, N. Y. It emerged June 5, 1936.

EURYTOMIDAE.

* *Eurytoma abnorme* Ash. (Det. Gahan.) Occasional specimens of this species were reared from elm throughout the seasons of 1935 and 1936.

* *Prodecatoma* n. sp. (Det. Gahan.) Three specimens of this species were bred from elm wood collected at Tarrytown, N. Y. Emergence was on August 12, August 15, and September 8, 1936.

EULOPHIDAE.

* *Entedon leucogramma* (Ratz.). (Det. Gahan.) This European species was occasionally reared from elm collected in various parts of Westchester County both in 1935 and 1936. Emergence began in July, but most of the specimens appeared in September. This species has been recorded as parasitic on various Scolytids in Europe.

EUPELMIDAE.

* *Eupelmus juglandis* Ashm. (Det. Gahan.) A few specimens of this species were reared from elm wood containing *Magdalis* spp. Emergence was in July from wood collected at Ithaca and North Petersburg, N. Y.

* *Eupelmus cyaniceps* var. *amicus* Girault. (Det. Gahan.) A few specimens of this insect were reared from elm wood.

PTEROMALIDAE.

* *Cheiropachus colon* L. (Det. Gahan.) Specimens of this species were occasionally reared from elm. It is apparently parasitic on *Scolytus multistriatus*.

CHRYSIDIDAE.

Omalus corruscans (Nort.). (Det. W. G. Bodenstein.) One specimen was reared from elm collected at Ithaca, N. Y.

FORMICIDAE.

FORMICINAE.

* *Camponotus fallax* Nylander. (Det. Townes.) A colony of this ant was found in a dead elm stub at Tuckahoe, N. Y., September 2, 1936.

Camponotus herculeanus (L.) subsp. *pennsylvanicus* DeG. This species is frequently found in dead and dying elms.

SPHECIDAE.

OXYBELINAE.

Solenius producticollis Pck. (Det. K. V. Krombein.) One specimen from an elm log.

ANDRENIDAE.

* *Halictus macoupinensis* Robt. (Det. G. A. Sandhouse.) One specimen from a dead elm stump.

MEGACHILIDAE.

Megachile sp. A nest of this bee was found in a dead elm at Tarrytown, N. Y.

DIPTERA.

TIPULIDAE.

Tipula penobscot Alex. (Det. Townes.) One specimen of this cranefly was reared from the trunk of a dead elm.

CECIDOMYIIDAE.

Several, as yet undetermined, specimens of this family were reared from elm logs.

MYCETOPHILIDAE.

(Det. E. Fisher.)

Leia bivittata Say. Reared in large numbers.

SCIARIDAE.

(Det. E. Fisher.)

Sciara coprophila Lint. Reared in large numbers.

Sciara fenestralis Zett. (*S. pauciseta* Felt.) Reared in small numbers.

* *Sciara* n. sp. (Near *S. ocellaris* Cmstk.). Two male specimens from Yonkers, N. Y.

STRATIOMYIIDAE.

(Det. Curran.)

Neopachygaster maculicornis Hine. Occasional specimens of this insect were reared from wood collected in various localities. It apparently breeds in moist bark.

COENOMYIIDAE.

Xylophagus lugens Lw. The larva of this fly was occasionally found under the moist bark of dead elms.

ASILIDAE.

Bombomima sp. Many pupal cases of this fly were found projecting from a dead area in a living elm at Mt. Vernon, N. Y.

DOLICHOPODIDAE.

(Det. Curran.)

* *Medeterus ciliata* V. D. Numerous specimens of this species were reared from material collected in various parts of Westchester and Rockland Counties, New York City, and Ithaca, N. Y. Except for the Ithaca specimens, it was always in association with *Scolytus multistriatus*. Other members of this genus have been recorded in the larval state as important predators of bark beetles.

Dolichopus ramifer Lw. One specimen was reared from elm bark.

ANTHOMYIIDAE.

Larvae of this family are often found under bark along the edges of wounds.

LONCHAEIDAE.

(Det. Curran.)

Lonchaea polita Say. Reared rather abundantly from elm logs, and usually in association with bark beetles. It is probably a facultative parasite of Scolytids, although usually acting as a scavenger.

OTITIDAE.

* *Euxesta* n. sp. (To be named by Dr. Curran.) A few specimens of this insect were reared from wood collected in New York City and Westchester County. This species was also observed feeding on sap issuing from *Scolytus multistriatus* entrance holes.

CHLOROPIDAE.

(Det. Curran.)

* *Gaurax apicalis* Mall. Reared from moist elm bark.

* *Gaurax montanus* Coq. Reared from moist elm bark.

AGROMYZIDAE.

(Det. Curran.)

Odinia maculata Meig. This species was reared fairly abundantly from elm logs collected in Rockland County. Most of the emergence was in May.

LEPIDOPTERA.

(Determinations by Dr. W. T. M. Forbes unless otherwise noted.)

TINEIDAE.

* *Oene hybromella* Chambers. Several specimens of this moth were bred from wood collected at Armonk, N. Y. Specimens emerged from June 17 until July 3, 1936.

OECOPHORIDAE.

Schiffermuelleria argenticinctella Clem. (Det. Forbes and J. F. G. Clarke.) This beautiful little moth emerged from wood collected in various parts of New York State. Emergence took place from the last week in May until the first week in July.

LAVERNIDAE.

Perimede erransella Cham. This moth was quite abundant in wood collected in many localities. Emergence took place from June 10 until July 5, 1936.

COSSIDAE.

Zeuzera pyrina L. This borer was found to be fairly abundant in elms in the New York City area.

HEMIPTERA.

ANTHOCORIDAE.

Orius insidiosus Say. (Det. Readio.) Several specimens of this small predacious bug were found under the bark of a dead elm at Yonkers, N. Y.

MIRIDAE.

* *Fulvius imbecilus* (Say). (Det. Townes.) One specimen of

this insect was found beneath the bark of a dead elm at Yonkers, N. Y., on September 11, 1936.

ISOPTERA.

TERMITIDAE.

Reticulitermes flavipes Kollar. The bases of dead and dying elms were occasionally found to be infested with this insect.

CORRODENTIA.

(Determined by Dr. P. J. Chapman.)

Corrodentia are frequently found in elm bark especially that of dying or dead trees. They probably feed on the fungi which grow under such conditions.

PSOCIDAE.

Psocus moestus Hag.
Psocus slossonae Bks.

CAECILIIDAE.

Peripsocus madidus Hag.

LEPIDOPSOCIDAE.

Echmepteryx hageni Pck.

THYSANOPTERA.

Thrips are occasionally met with under elm bark. Eggs, nymphs, and adults of one species were quite abundant in pupal cells of *Magdalis armicollis* from which the adult had emerged.

Dear Reader.—How about that little note to fit this space.—Yours, **Ye Ed.**

NEW LEPIDOPTERA FROM THE NEW JERSEY PINE BARRENS.

BY FREDERICK LEMMER, Lakehurst, N. J.

Three new melanistic forms of Phalaenidae[1] and one new species and one melanistic form of Geometridae are described.

PHALAENIDAE.

HADENINAE.

Polia adjuncta **benjamini** new form. A melanistic form of *adjuncta* Bdv.

Fore wing with all of the normal white replaced by sordid smoky luteous. Hind wing dull smoky, tinged with luteous and lacking the normal contrasts.

Type locality: Lakehurst, N. J.

Number and sexes of types: Holotype ♂, May 21–31; Allotype ♀, September 4, captured by the author. Also one paratype ♂ from New Lisbon, N. J., August 31, 1934 (Dr. Emlen P. Darlington) and one paratype ♂ from Cranford, N. J., June 4 (Mr. Otto Buchholz), in their respective collections. Reared on golden glow by Dr. Darlington. Holotype deposited in the U. S. National Museum. Allotype in the author's collection.

Named in honor of my good friend, the late Mr. Foster H. Benjamin.

APATELINAE.

Apatela afflicta **schmalzriedi** new form. A melanistic form of *A. afflicta* Grote.

Agrees perfectly with *afflicta* in all structures including the genitalia. Differs by having most of the normal markings of the fore wing hidden by a heavy powdering of black and blackish-brown scales; with the white ring of the orbicular, three minute white costal points, a few white scales in the subterminal line, and the checkered white fringe, strongly discon-colorous with the black ground. Hind wings of all but one normal. The latter specimen has the hind wings darker than normal, which occasionally occurs in otherwise typical *afflicta*. The fore wings are not quite as melanistic as in the other specimens although the orbicular outline is pale.

Type locality: Lakehurst, N. J.

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[1] Noctuidae of Authors.

Holotype: ♂, May 11–20, 6 paratypes, ♂♂, June 11–20, August 21–31, also Lakehurst, N. J.

Notes: Captured by the author. Holotype and last-mentioned paratype deposited in the U. S. National Museum, five paratypes in the collection of the author.

Named in honor of my friend, Dr. Elmer W. Schmalzried.

CATOCALINAE.

Catocala sordida **engelhardti** new form. A melanistic form of *sordida* Grote.

Primaries dark brown. Inner margin black as usual. T. a. and t. p. lines at costa, also median shade at that point black. Continuations practically lost in the dark brown. Veins of primaries and outline of reniform black. Fringes darker as in normal specimens. Light bands of underside grayish white at costa. Base of costa grayish white. Secondaries and underside normal. Thorax dark brown. Collar lappet black tipped with light gray. Palpi dark brown tipped with light gray. Face dark brown. Legs dark brown with joints grayish white. Few grayish white scales interspersed all over primaries and thorax.

Type locality: Lakehurst, N. J.

Number and sexes of types: Holotype ♂, July 9, 1932; Allotype ♀, July 10, 1932; paratype ♀, July 5, 1933.

Notes: Allotype deposited in the U. S. National Museum, holotype and paratype in the author's collection.

Named in honor of my friend, George P. Engelhardt.

GEOMETRIDAE.

GEOMETRINAE.

Apaecasia atropunctata **darlingtoni** new form. A melanistic form of *A. atropunctata* Packard.

Forewings: basal area from middle of inner margin to center of apex medium brown, from there to outer margin including fringes blackish brown, no sharp lines separating the areas. Secondaries similar except that basal third is a shade lighter than inner area of primaries, but the outer two-thirds as dark as these. Basal band of primaries brown, in *atropunctata* black. The brown bands through center of both wings present but somewhat darker. The black spots on both wings more numerous. Discal spots present. Two black spots on second segment of body of females as in *atropunctata.* Two black spots each on second, third and fourth segments of body of male. Black dotted line of secondaries indicated. A row of light spots outside of and adjoining the black spotted rows on both wings of upper side of male. These light spots are traceable in ♀ but are practically lost in the dark scales. Underside darker, especially between dotted lines and outer margin. It shows dotted lines and discal spots more clearly. There is also a row of black dots at base of fringes, one between every vein which only one specimen of *atropunctata* of nine before me shows though more faintly. This applies to the ♀ of the new form especially. In the male they are very faint and some are entirely missing. Head brown.

Type locality: New Lisbon, Burlington Co., N. J.

Sexes of types: Holotype ♂, June 1, 1935; Allotype ♀, May 5, 1930, both caught at light by Dr. Emlen P. Darlington and both in his collection.

I take pleasure in naming this form for Dr. Darlington.

Pseudoboarmia buchholzaria n. sp.

Related to *umbrosaria* Hübner, of which I consider *gnopharia* Guenée a synonym.

Markings similar, variable, but the ground color always dark, fuscous bathed with some dull violaceous and more or less sparsely powdered with scattered violaceous white scales.

The male genitalia are similar to those of *umbrosaria,* but differ by the weaker spines of the aedoeagus and by the possession of a somewhat smaller clasper, which is less heavily armed with spines.[2]

No specific difference was observed in the female genitalia.

No trace of any hair pencil was found on any specimen of the long type series of the present species. Male specimens of *umbrosaria* seem consistently to possess hair pencils on the hind tibiae. These pencils are occasionally lost by rubbing, but usually a few hairs remain, or at least the points of origin can be discerned.[3]

This character holds true in a long series of *umbrosia* from N. J., N. C., Fla. and Tex., as well as in the probable male type of *gnopharia*[4] now in the U. S. National Museum *via* the Barnes collection.

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[2] Ten slides of the male genitalia: Five made from specimens of the present new species, from Lakehurst, N. J. (4) and "Fla." (1); and five made from specimens of *umbrosaria* from N. J., Fla., Tex. and "Am. Bor." (supposed type male of *gnopharia*), have been studied.

[3] McDunnough, 1920, Tech. Bull. XVIII, Entom. Branch, Canadian Dept. Agr., page 22, lists hair pencils present or absent, suggesting that two geographical races are involved, a Florida race possessing hair pencils, and a more northern race lacking them.

Type locality: Lakehurst, N. J.

Other localities: Southern Pines, N. C. (1 ♂, 1 ♀) and "Fla." (1 ♂), according to specimens in the U. S. National Museum.

Number and sexes of types: Holotype ♂, allotype ♀, 127 ♂, 61 ♀ paratypes, various dates, May to August, all collected by the author at Lakehurst, N. J.

Food plant: Sweet fern (*Comptonia asplenifolia* L.).

Notes: Holotype ♂, allotype ♀, and 47 ♂, 25 ♀ paratypes deposited in the U. S. National Museum; 6 ♂, 6 ♀ Buchholz collection; 74 ♂, 30 ♀ paratypes in the author's collection.

Named for my friend, Otto Buchholz.

A specimen of the present new species is in the U. S. National Museum ex Collection of the Brooklyn Museum; it is labeled "*Selidosema fuliginaria Type* Hulst" in Hulst's handwriting but bears the locality label "Fla." instead of "Ill." and further violates the original description of *fuliginosa* by the possession of large, well-marked, ovate discal spots on all wings. This specimen must be considered a spurious type.

"*Selidosema gnophosarium*" (!) of Barnes and McDunnough (nec Guenée), (1912, Contrib. Nat. Hist. Lep. N. Am., I (4), 19, pl. VIII, f. 15), seems to fall to the present species. The figured specimen, a female labeled "So. Pines, N. C.," is in the U. S. National Museum, as is a single corresponding male from the same locality. This male lacks an abdomen so that the genitalia cannot be compared. However, no traces of any hair pencils could be found.

In the original description of *gnopharia,* Guenée (1857, Spec. Gén., IX, Phal., I, 251) cites the food plant, oak. The author has reared larvae of *umbrosaria* on white birch (*Betula populifolia* Marsh). They starved to death when given sweet fern, the food plant of *buchholzaria.*

A Psammocharid at a High Altitude.—On Aug. 13, 1936, my wife and Miss Hester Rohwer found a Psammocharid wasp among rocks at 12,000 ft. on the Trail Ridge Road, Colorado. I suppose this is the highest altitude known for a wasp of this group. The species has been determined by Dr. Nathan Banks as *Anoplius luctuosus* Cresson. The spiders found at the same time and place was sent to Mr. W. J. Gertsch, and prove to be species of *Pellenes, Drassodes, Titanebs* (*T. pepinensis* Gertsch) and *Thantus.*

T. D. A. Cockerell, Boulder, Colo.

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[4] See Oberthür, 1913, Ét. Lép. Comp., VII, 274.

SOME NEW SPECIES OF LEAFHOPPERS IN GROUPS RECENTLY SEGREGATED FROM THAMNOTETTIX.*

By E. D. Ball, Tucson, Arizona.

The writer in a recent number of the Bulletin described several new genera of tree- and shrub-inhabiting leafhoppers that formerly had been included in the genus *Thamnotettix*. In this paper the new species that have accumulated in two of these new genera are characterized.

Idiodonus snowi Ball n. sp.

Resembling *kennicotti*. Shorter and stouter with a shorter vertex which is almost parallel margined. The clypeus much shorter and broader with black spots. Much smaller. Length ♀ 5.5 mm. Cinnamon above and creamy below, the margins of the vertex creamy. The median band peppered with red. A trace of the ivory "collar" on the red-peppered pronotum.

Holotype ♀, allotype ♂, and 11 paratypes, Pinal Mts., July 18, 1935. Three paratypes, Santa Rita Mts., June 22, 1930. All taken by the writer in Arizona. Paratypes in the Snow collection, University of Kansas. Named for Chancellor F. H. Snow who first collected this as well as so many other new and interesting leafhoppers in Arizona.

Idiodonus delongi Ball n. sp.

Smaller, shorter and much darker than *kennicotti,* with a definitely shorter, parallel-margined vertex. Length 4–5.5 mm. Vertex and face creamy, sometimes red-peppered above the two black spots. Whole dorsum above the subhyaline margin of the elytra rich red-brown, unmarked.

Holotype ♀, allotype ♂, Sanford, Fla., Sept. 30, 1925. Twelve paratypes from the same place in September and October, all collected by the author and a pair from Hillard, Fla., August 19, 1930, Beamer.

Idiodonus heidemanni var. **chinonus** Ball n. sp.

Resembling *heidemanni,* but smaller and more slender with a much longer and more inflated head. In typical *heidemanni,* the vertex is very broad, slightly angled with the margins usually concave, while in *chinonus,* the vertex is much narrower, longer and more inflated in both diameters. Length 3.5–4.2 mm. In color they vary like the species from nearly all pale cinereous to almost entirely peppered with red, but they usually have a pair of black points on the vertex.

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* Types in the author's collection unless otherwise specified.

Holotype ♀, allotype ♂, and one paratype, Chino, April 30, 1908, and twelve paratypes San Diego, July 5, 1931. All taken by the writer in California.

Idiodonus wickhami Ball n. sp.

Resembling *heidemanni* but with a shorter and more depressed vertex and with heavy black markings and red flecking, which on the elytra appears as red alternations along the extremely white nervures. In *heidemanni* they appear as red dots irregularly distributed over the surface. The vertex margin has two heavy black dots in a quadrangular creamy area, which is bounded by a black line above and by the heavy dark arcs below. There are three black dots against each eye, a widely separated pair at base of vertex, an irregular sub-marginal row on the pronotum, a pair of approximate black spots at the base of the orange scutellum and a pair of ivory dots on the lateral margin. Length of ♀ 4.5 mm.

Holotype ♀ and one paratype, Mesa, April 8, 1934; allotype ♂ and two male paratypes, Mesa, April 1, 1934. One male paratype, Mormon Lake, August 6, 1929, and nine female paratypes, San Francisco Mountains, August 12, 1929. All taken in Arizona by the writer.

Idiodonus terminalis Ball n. sp.

Larger, darker and more strikingly marked than *schwarzi*, the female segment with a *clitellarius*-like notch and strap-shaped projection instead of the usual sinuate margin. Male plates definitely broader apically instead of filamentous. Length ♀ 6 mm.

Vertex nearly half longer compared to its width than in *schwarzi*, with a transverse brown line. A pair of submarginal spots on the pronotum, broad stripes along the claval sutures and the tips of the claval veins ivory. The medius heavily darkened with the terminal apical cell smoky.

Holotype ♀, Glenn Oaks, June 21, 1935: allotype ♂, Santa Rita

Mts., June 22, 1930, and 14 paratypes from these mountains and the Santa Catalina and Atascasa Mountains, Granite Dells, Patagonia, Nogales and Tucson. All collected in the mountains of Arizona by the writer.

Idiodonus beameri Ball n. sp.

Size of form of *schwarzi* nearly, coppery brown with eight spots across the margin of vertex and a broad white costa. Length ♀ 5.5 mm.

Vertex rounding, parallel margined, twice wider than long, uniformly rounding to front. Venation as in *schwarzi,* the radius concolorous with the white margin. The medius very dark in contrast, the central anteapical not expanded as much anteriorly. Female segment much broader than long, rounding posteriorly with a V-shaped notch reaching one-third the depth. Male valve triangular, the plates together narrow, roundingly narrowing and then produced into long, almost filamentous points, the basal broad portion appearing to be a separate plate.

Color: Deep brown with a strong coppery reflection, the broad margin of elytra and below white in sharp contrast. Face with abbreviated arcs, the two upper ones often ending in black points. Two large spots on the rounding margin as in *schwarzi,* two smaller ones that taper to the ocelli which they partly enclose; outside the ocelli on each side two quadrangular ones separated by a white line. The scutellum has a heavy (+) St. George's cross. The claval veins pale, the rest dark, except on the costal white stripe.

Holotype ♀, allotype ♂, and five paratypes, September 11, 1935, and three, October 6, 1932, all taken by the writer in the Chiricahua Mountains of Arizona. Named for Dr. R. H. Beamer, whose collecting parties have done splendid work in this region.

Idiodonus uhleri Ball n. sp.

Resembling *geminatus* Van Duzee, larger with a broader head, larger spots and no dark nervures. Pale green with four black spots on the head. Length ♀ 5.5 mm.

Head broader than in *geminatus,* the eyes exceeding the pronotum, the vertex very slightly longer on the middle than against the eye instead of definitely produced as in that species. Elytra with the venation similar in pattern but the nervures concolorous or white, while in *geminatus,* they become smoky and distinct towards the apex. Genitalia of the typical notch and strap pattern, the male plates broader and regularly tapering rather than rounding and then produced.

Color: Pale green, the vertex, scutellum and all below pale yellow. A pair of spots on apex as in *geminatus;* another pair larger than those in *geminatus* and set against the margin of the eye instead of some distance from it. Pronotum with only a trace of the white margin and scutellum with only a line in the transverse suture instead of three pairs of spots. The face unmarked.

Holotype ♀, allotype ♂, and four paratypes taken by the writer in Pine Valley, California, July 6, 1931.

Colladonus clitellarius var. **marcidus** Ball n. var.

Size and form of typical *clitellarius* but with the dark brown replaced by a light golden brown as in *eburatus* Van D. From the latter it differs by the smaller size and the two spots on vertex.

Holotype ♀, July 21, 1919; allotype ♂ and three paratypes, Ames, Iowa; two paratypes, Madison and Green Bay, Wisconsin; all taken by the writer: four paratypes, Long Island (Olsen); one, Kentucky (Wirtner), and one, Illinois (Gerhardt).

Colladonus montanus var. **mulsus** Ball n. var.

Size and form of typical *montanus* Van Duzee, but with the dark brown replaced by light or golden brown as in the above variety of *clitellarius.* The pronotal band is always present and the saddle may be quite distinct or obscure. In case it is distinct, the median line is darkened before and after the saddle and again at tip.

Holotype ♀ and allotype ♂, Muir Woods, California, June 17, 1934, and eleven paratypes from Watsonville, San Luis Obispo and Spreckels, California, Wells, Nevada, and North Park, Colorado, all collected by the writer.

Typical *montanus* as thus restricted is very dark with the base of the vertex dark, a definite saddle and often two small black spots on vertex. Variety *reductus* Van D. is dark and has lost the saddle while *mulsus* has the dark replaced by golden and may have the saddle. Var. *marcidus* of *clitellarius* is similar in color but has a broad saddle and definite black spots on vertex.

Colladonus cachellus Ball n. sp.

Size and form of *mendicus* Ball, nearly, with a more pointed vertex and lacking the dark markings. Female pale cinnamon, male light olive, both with oblique, dark chevrons across the cross nervures. Length ♀ 6 mm.

Vertex conical, little longer than in *mendicus,* but more pointed. Twice as long on middle as against eye. Pronotum much more arched into head than in *mendicus.* Female segment with a broad, shallow notch and a broad, short strap, broadened and bilobed at the apex. Male plates of the usual "spoon" type.

Color: Female, pale cinnamon above and below, the pronotum with a broad, rather indefinite light "collar." The vertex and face lighter with pale cinnamon arcs and lines. Male, pale olive above, vertex and below creamy, the "collar" broadly olive. Both sexes with a pair of dark triangles separated by a pair of round spots along the base of scutellum. A pair of oblique, brown chevrons across the cross nervures, the tips of the claval nerves and several spots in the areoles milky, the apical cells smoky.

Holotype ♀, Logan Canyon, August 12, 1916; allotype ♂ and one male paratype, same place, July 26, 1915. All taken in Utah by the writer, one female paratype, Milford, Utah, September 3, 1928, taken by E. W. Davis.

Colladonus egenus Ball n. sp.

Size and form of *mendicus* Ball, nearly. Pale creamy white with a dorsal stripe interrupted by the collar and a pair of oblique black chevrons. Length ♂ 5.5 mm.

Vertex slightly broader and less acute than in *mendicus* and lacking the black spots at apex. Pronotum with the ivory collar of *mendicus* but paler, the markings in front of the collar pale brown. Scutellum creamy subhyaline with the nervures concolorous. The scutellar and sutural margins brown, interrupted by the creamy apices of the claval nervures. The central apical cell dark smoky and all the nervures bounding the apical cells, except the one on costa, dark brown. A pair of oblique black chevrons on the middle of the corium, not reaching the costal margins. Genitalia as in *mendicus.*

Holotype ♂, Chilliwack, B. C., July 28, 1924; allotype ♀, Spanish Fork, Utah, August 11, 1931 (Bowen).

Colladonus ponderosus Ball n. sp.

Resembling *tahotus* Ball but one-half larger and lacking the white costal and vertex margins. Length ♀ 6 mm.

Head narrower or only equalling the pronotum, while in *tahotus* it exceeds it in width. The vertex definitely longer in the middle than against the eyes, whole dorsum reddish brown, below tawny. The apex of the head is slightly lighter than the dorsum with two small round spots about twice their own width from the suture at the ocelli. The tips of the claval veins ivory but no ivory on the costa. The female segment has a much shallower notch than in *tahotus* with a broad strap.

Holotype ♀ and one female paratype taken by the writer in the Chiricahua Mountains, Arizona, September 11, 1935.

Colladonus arculus Ball n. sp.

Resembling *tahotus* in size and form; pale greenish white with three sides of a black box on vertex. No spots on apex. Length ♀ 5 mm.

Vertex one-third longer on middle than against the eye, obtusely angled, more acutely angled with the face than in *tahotus* without apical spots. A broad dark band across vertex just back of ocelli, often interrupted on the median suture and not extending beyond the ocelli which are distant from the eyes. From the outer ends of this band dark lines extend back nearly to the base of the vertex, forming a three-sided black box. There are narrow irregular crescents behind the eyes, black spots inside the basal angles of the scutellum and dark arcs on the face. The upper pair are more widely spaced, shorter and heavier than the others. The male plates are of the typical long-spoon shape, the female segment with a typical excavation but this is almost entirely filled by a very broad bifurcate strap. Pale forms may lose all the dark markings except two spots back of the vertex.

Holotype ♀, allotype ♂, and 14 paratypes taken by the writer at Medford, Oregon, June 27, 1934.

AN ANNOTATED LIST OF SOME PENTATOMIDS (HETEROPTERA) FROM NEW MEXICO.

By Herbert Ruckes, College of the City of New York,
New York, N. Y.

In 1932 the author had the opportunity of spending about nine months in New Mexico. With headquarters located in the upper end of Little Tesuque Canyon, at what is now the Hyde State Park, collecting in that locality was naturally more intense than in any other. However, with good roads making many localities in the state available it was only a matter of time that prevented a more extensive survey. New Mexico presents a varied topography. Its high flat mesas are broken from north to south by long, high mountain chains, the southern ends of the Rockies. The northern part of the state with an average altitude of about 7000 feet slopes gradually southward to a relatively low elevation of less than 3000 feet in the Mesilla Valley about Las Cruces and El Paso, Texas.

The Sangre de Cristo Range north and east of Santa Fe offers excellent collecting, with its very varied vegetation and climatic conditions. Arid canyons dissect the high peaks (Santa Fe Baldy and others reaching more than 12,000 feet elevation) ; the western ridges of this range are slightly less humid than the eastern ones. The stream banks of such rivers as the Pecos, Rio Grande, Santa Fe, etc., leave little to be desired in the way of vegetation to be collected.

Between Albuquerque and Santa Fe, lying just west of the broad valley of the Rio Grande are the Jemez Mountains. These are probably the richest, faunistically, in the state. They have hardly been studied. In Don Ana County, in the southern part of the state, lie the San Andreas and Organ Mountains. The latter offer the better collecting due to the prevalence of steady flowing streams and small waterfalls.

The major part of the state is arid mesa country, but in spite of its aridity is rich both in plants and insects. Some of the better collecting spots found are at Socorro, Hot Springs, Elephant Butte and roads leading west from Las Cruces to Deming. Unfortunately, time did not permit collecting in the Gila Valley or the Black Range, both of which should prove interesting.

Again, in 1935, a chance to collect at very high elevation of the Sangre de Cristos presented itself. Here opportunity permitted a comparison between low altitudes and high altitude forms. In general, pentatomids are not found above 8500 feet. Above that height, cicadellids, membracids, fulgorids, mirids, small lygaeids and reduviids are common but heavy, large bodied hemiptera are scarce. To what factors this is due is uncertain. Perhaps the short breeding periods available, lack of proper food plants and relatively low temperatures and inability to fly to those heights are important.

The following annotated list does not include records of all species from New Mexico, but does contain the species collected by the author during the two periods mentioned above. A number of new records (*) are included; the number next to each species is that of Van Duzee's 1917 catalogue of N. A. Hemiptera.

SUBFAMILY PENTATOMINAE.

Tribe Halyini.

The genus *Brochymena* which represents this tribe has the following species in New Mexico, all collected from the trunks of yellow pine, (*Pinus ponderosa* Engelm.) or Douglas spruce (*Pseudotsuga mucronata* Raf.)

Brochymena aborea (Say) 81. Not common but found occasionally through the upper reaches of the Pecos Valley at Cowles and trails leading to Santa Fe Baldy Peak in San Miguel County about 8000 feet altitude; June–July.

B. myops Stål 84. Less common than the preceding. Specimens all taken from *P. mucronata* Raf. bark at Cowles. Altitude about 8000 feet; July.

**B. quadripustulata* (Fabr.) 85. Only one specimen taken in Little Tesuque Canyon at about 7500 feet altitude.

**B. hoppingi* Van D. 85a. The most abundant species in this genus but probably less widespread than the others. About 50 specimens were taken at one catch from large *P. ponderosa* Engelm. trunks in the Jemez Mountains, Rio Ariba County, at about 8500 feet elevation. These were in hibernation on March 20, 1932. In 1935 additional specimens were taken in July at Panchuela near Cowles.

Tribe Pentatomini.

Peribalus limbolarius Stål 94. This abundant and widespread species was taken from grasses in fresh meadows through the Santa Fe and Tesuque Canyons, at Cowles, Therma and near Raton. The species extends well northward where, in Colorado, it is even more abundant. Elevations vary from 7000 feet to 8500 feet.

**Rhytidolomia viridicata* Walk. 100. Not uncommon but not found abundantly in any locality. Appears to be a late summer form taken from *Verbena macdougalii* Heller. Santa Fe and Tesuque Canyons and Cowles. July 25 to August 28. Elevation from 7500 feet to 8500 feet.

**Chlorochroa sayi* Stål 109. A very abundant species and in some counties a pest of economic proportions. In the wild state taken from the axils of the leaves of Yucca (*Y. baccata* Torr.). In the southern part of the state the species has become very obnoxious in the irrigated farm lands. Taken in hibernation at Roswell, Chaves County, at about 3500 feet. March 1. Distributed commonly at lower altitudes about Hot Springs, Socorro County; Las Cruces, Dona Ana County; Alamogordo, Otero County; May to August.

C. ligata (Say) 108. This, a larger and darker species than *C. sayi*, is less abundant but has about the same range of distribution in time and area. Likely to be found more northerly.

**Carpocoris remotus* Horv. 110. A species that extends from the Southern Colorado line over the Raton Pass into Colfax County. More abundant in central Colorado. Two specimens taken near Raton; July 6; Elevation about 7000 feet.

Solubea pugnax (Fabr.) 117. The author's records show only one specimen from the northeastern part of New Mexico. The species is much more abundant in central Kansas and eastern Colorado.

Euschistus servus (Say) 118. The least abundant of the species in the state. Taken in sweeping lush meadows near Therma at an elevation of about 7000 feet. Much more abundant in the plains states and eastward; August 2.

E. euschistoides (Voll.) 121. While this species is recorded from Colorado and the north it is yet to be found in New Mexico. In the east and central west it is of very common occurrence.

E. inflatus Van D. 123. Very common in the axils and flower clusters of the mullein (*Verbascum thapsus* L.). Taken at Ruidoso Creek, Lincoln County, at about 6000 feet elevation, June–July. This species is likewise abundant in northern Colorado, where author took several dozen specimens in Rist Canyon near Fort Collins.

**Aelia americana* Dall. 144. A single specimen taken at the southern border of Colorado near Raton Pass. It probably occurs sparsely in the northern part of the state.

Prionosoma podopioides Uhl. 156. Exceedingly common in the axils and flower clusters of wild sunflowers (*Helianthus* spp.) along ditches and decadent farmsteads. The gray pubescence of the bug blends well with that of the plants. I have frequently found this species and *Perillus clanda* (Say) mutually occupying the same inflorescences. More northerly in its distribution. Records from Raton and roads leading into Colorado; July–August; elevation 6000 feet.

**Thyanta custator* (Fabr.) 158. This is the most abundant pentatomid in the state. It is commonly taken in old grain fields and meadows, feeding on the younger leaves of wild and domestic grains. Well spread over the state. Collected from Therma, Tesuque Canyon, Santa Fe Canyon, Las Cruces, Roswell and Datil. The author has no records from the northwestern part of the state, 3000 to 8500 feet elevation; May–September.

Thyanta casta Stål 161. This species is recorded from the southern part of the state where it is found occasionally. The author does not have specimens of it from New Mexico.

**Thyanta rugulosa* (Say) 163. Much more abundant in the north but found occasionally at Therma and through the Cimmarron Canyon, Colfax County, in tall wild and domestic grasses. The smallest of all the pentatomids of the state; elevation 6500 to 7000 feet; June–August.

Murganita histrionica (Hahn) 172. This well-known pest occurs occasionally on wild radishes and escaped cabbage from adjacent farms. It is of course much more common in cultivated plots. In the wild state found along the Rio Grande Valley on escapes in ditches. In cultivated grounds along the Messilla irrigated area in Dona Ana County; elevation 3000 feet to 7000 feet; July–August.

**Banasa dimidiata* (Say) 182. One specimen in sweeping wild native oak (*Quercus gambelii* Nutt.) at Tesuque Canyon; August; elevation 8500 feet.

Banasa sordida (Uhl.) 186. More common than the preceding. Found under duplicate conditions; August 10–28, 1932.

SUBFAMILY ACANTHOSOMATINAE.

The only genus and species of this subfamily occurring in New Mexico is

Elasmostethus cruciatus (Say) 204. All the specimens taken as a record were procured by beating old escaped apple trees in the mid-region of Little Tesuque Canyon, Santa Fe County; elevation 7000 feet; August 1 to 26, 1932.

SUBFAMILY ASOPINAE.

**Apateticus bracteatus* (Fitch) 225. Little Tesuque Canyon near Santa Fe (Santa Fe County), elevation 8000 feet feeding on lepidopterous larvae in apple trees; July 15.

**Podisus modestus* Dallas 229. A single specimen from sweeping at Las Cruces, Dona Ana County; elevation 3600 feet; June 16.

**P. serieventris* Uhler. 228. Many specimens from Little Tesuque Canyon, Santa Fe County; elevation 7500–8500 feet taken in sweeping; usually feeding on lepidopterous larvae; July 15.

**P.* (*Apateticus*) *marginiventris* Stål 223. One specimen from Little Tesuque Canyon, Santa Fe County. This very rare species, the darkest and largest of the genus was taken in flight from an old apple tree. Probably feeding on larvae, since all species of *Podisus* are predacious; 8200 feet elevation; August 25, 1932.

Zicrona cuprea Dallas 235. Only one specimen of this supposedly common species was taken in Santa Fe Canyon in sweeping lush grass meadows in the vicinity of the Forest Ranger's Cabin at Monument Rock; about 8000 feet elevation; June 29.

Perillus exaptus Say 218. Dark forms, with relatively little red marking on the scutellum taken in sweeping rich grassy marshland at Therma, Colfax County; 7800 feet altitude; July 25.

P. bioculatus Stål 216. Forms darker than the typical ones, and like the preceding species with less red on the scutellum and prothorax. Common on species of sunflower and wild aster. Tesuque Canyon and mesas about Santa Fe County; July 13 to August 25.

P. clanda (Say) 216a. The very common light form of *P. bioculatus* in which the markings are creamy white instead of red. Abundant along roadsides; predacious on potato beetle larvae which infest wild sunflowers (*Helianthus* spp.). More common in northern New Mexico, near the Colorado line. Taos, Therma, Red River and into Trinidad Colo.; 5000 to 8000 feet; August 12 to 28.

P. confluens (H. H.) 214. While this species is recorded from New Mexico, the author has no specimens recorded from any locality. It is probably of more southern distribution.

Mineus strigipes (H. S.) 221. This very beautiful small pentatomid has a more eastern range. It has been recorded from New Mexico by Uhler in 1876. This has always been considered as a doubtful record. It is well that the record can now be verified from two specimens taken while sweeping tall grasses in a lush meadow at Laguna Vista near Therma at an altitude of about 8500 feet; Aug. 28, 1932. The habits of this insect are not at all well known but it is very probable that its habitat is tall grasses in moist situations where it feeds on small fleshy insects since it is predacious like other members of its subfamily.

PROCEEDINGS OF THE SOCIETY.

Meeting of May 14, 1936.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, May 14, 1936, at 8.10 p. m. President William T. Davis in the chair and six other members present, namely, Messrs. Dietz, Engelhardt, McElvare, Moennich, Sheridan and Siepmann; also Messrs. J. W. Angell, Wm. H. Cole, Ferdinand Dostal, Richard Fisco, L. L. Pechuman, Hans L. Stecher and Miss Dietz.

The minutes of the previous meeting were read and approved. Mr. Engelhardt presented the customary Treasurer's report.

Mr. Davis read a communication from Alexander J. Wall, librarian of the New York Historical Society, acknowledging receipt of the Certificate of Incorporation of the Brooklyn Entomological Society, which had been deposited in that library.

Mr. J. W. Angell reported the capture of the following beetles: *Scaphinotus viduus,* May 10, at Twin Lakes, and *Cicindela formosa* var. *generosa,* May 3, at the Palisades, Englewood Cliffs, N. J.

Mr. Engelhardt said that he had noticed that the praying mantis will eat the monarch butterfly, a species generally regarded as inedible. The mantis seems to prefer the thorax, rejecting the abdomen. Mr. Davis added that on Staten Island the mantis and the automobile have considerably reduced the number of butterflies.

Mr. Moennich exhibited a collection of beetles obtained in fungus, *Staphylinidae* predominating, together with specimens of fungus with which they were associated. Some species are found on the stems of the fungus, while others are in the gills.

Mr. William T. Davis reported that 21 individuals of the Pentatomid, *Podisus placidus* Uhler, were found on May 1, 1936, on Richmond Hill, Staten Island, New York, either on or near the webs of the tent caterpillar. One of the bugs was feeding on a caterpillar and there were several mated pairs. Mr. Davis exhibited specimens of *Podisus placidus* and *P. modestus,* and read excerpts concerning their distribution and habits from Blatchley's "Heteroptera of Eastern North America." Both species are reported by Kirkland to feed on the larvae of the tent caterpillar.

Mr. Engelhardt showed a selection of the clearwing moth *Memythrus pyramidalis,* a species subject to many variations throughout its distribution across the North American continent. First described by Walker in 1856, this insect has been renamed many times since, resulting in a long list of synonyms, excepting such names as have been retained to designate variations and geographical races. The color variations run from black to yellow and bright red. The moths are active fliers, visiting flowers on sunny days in July and August. They are encountered most frequently in the vicinity of their foodplant, *Epilobium angustifolium*, the common fireweed. The larvae, upon hatching from eggs laid or dropped at the base of flowering stalks, work their way downward to the permanent horizontal roots, often a foot or more underground. In early summer they leave their burrows to pupate in an oblong cocoon of chips and silk in the soil near the surface.

The life history of this insect escaped discovery until worked out in Saskatchewan and Alberta within recent years. Dr. Frank M. Jones, of Wilmington, Del., collected a number of the larvae at Martha's Vineyard, Mass., during September, 1935. These have wintered successfully and it is hoped to breed them through. It is the first record of a breeding experiment for the species on the Atlantic Coast.

The meeting adjourned at 9.50 p. m.

Carl Geo. Siepmann,
Secretary.

Meeting of October 15, 1936.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, October 15, 1936, at 8.15 p. m. President William T. Davis in the chair and seven other members present, namely, Messrs. Bower, Dietz, Engelhardt, Lacey, Ragot, Siepmann and Wilford; also, Miss Dietz and Messrs. Laurence Bukman, Peter Crowe, Emil Eppert, Richard Fisco, Arnold Kitzes, Gabe Morosco, Hans L. Stecher, Andros Thomson and Lester Weiss.

The minutes of the previous meeting were read and approved. Mr. Engelhardt presented the customary report of the Treasurer and also reported for the Publication Committee, outlining the progress made in getting the new edition of the *Glossary* ready for publication.

Mr. Engelhardt also said that Dr. Karl Eller, of Germany, was interested in obtaining specimens of American *Papilio* and particularly living pupae, and would appreciate any help that American entomologists might be able to render him. He exhibited a copy of Dr. Eller's recent book, "Die Rassen von *Papilio machaon*," published by the Bavarian Academy of Sciences.

Mr. Dietz reported that he had collected in the Bronx Park during the past season, obtaining a fine series of *Catocala meskei*, ten males and one female.

Large swarms of *Cicindela repanda* were seen by Mr. Ragot during the past summer.

Mr. Hans Stecher reported collecting in Texas and the gypsum sand regions of New Mexico. These sands superficially resemble snow-fields, and cover an area of 270 square miles. Small hills of sand rise from five to seventy-five feet. The insects frequenting the dunes are usually whitish or grayish in color, but some are jet black. Many of the beetles leave their trail in the soft sands, and some of them assume a curious posture when walking, with the hind body raised. This position assists them in climbing the steep dunes.

The capture of two specimens of *Cicindela unipunctata* at Lakehurst, N. J., was reported by Peter Crowe.

Richard Fisco obtained the wasp, *Scolia dubia,* at New Dorp, Staten Island, a new record for the Island.

Mr. Bower reported investigating nests of hymenopterous insects in search of Mutillidae with moderate success.

The deaths of Dr. John J. Schoonhoven, a member of the society, and Max Rothke, of Scranton, Pa., were reported by Mr. Engelhardt.

Mr. Davis exhibited a strong round fiber container of the type commonly used by storekeepers for cream and other liquids, and spoke of the usefulness of this type of container in shipping small lots of insects through the mails.

Specimens of the dragonfly, *Libellula vibrans,* and the grasshopper, *Dendrotettix quercus,* were also exhibited by Mr. Davis. The former species occurs in numbers on Staten Island every once in a while, and 1936 was one of the years it was abundant. The grasshopper he reported as being injurious to trees at Yaphank, L. I., and near Lakehurst, N. J., in 1936, and read excerpts from his articles on the species in the BULLETIN, vol. X (1915), and *Entomological News* for June, 1912.

Mr. Davis read a letter from Mr. Lemmer, in which the following captures at Lakehurst, N. J., were reported:

Orthosia rubrescens Wlk. Early in season, quite a few.
Conistra dubia Grt.
Parastichtis puta a. *fusca* Sm. New to New Jersey.
Callopistria (*Eriopus*) *floridensis* Gn. October 10 at bait, apparently new for the State.
Parahypenodes quadralis B. & McD. New to New Jersey, described from Quebec, May 15, 1918.
Xylophanes tersa L.

Cladara atroliturata Wlk.

Mr. Engelhardt spent the summer in Arizona and California, and will tell of his experiences and results of field work at another meeting.

He stated that to him the most important record of the season was obtained in his own garden, namely, the breeding of the clearwing moth, *Paranthrene scepsiformis,* from larvae found boring in the roots of Boston ivy, *Parthenocissus tricuspidata.* Such larvae had been noticed in previous years, but because of similar habits it was assumed that they were *Memythrus fraxini.* It is an anomaly that a search futile for many years for the foodplant and early stages of an insect should have been solved finally in one's own dooryard. It is a first record for New York State. *Paranthrene scepsiformis* is poorly represented or absent in leading collections of Lepidoptera. This, in large part, undoubtedly is due to the perfect mimic of the moth, in appearance and action, to the common eastern Polistes wasp. It ranges southward to the Gulf of Mexico, as far as Texas. The native foodplant is Virginia creeper, *P. quinquefolia.* The moths are at large in July and early August. Before pupation the larvae leave their burrows to spin an oblong cocoon of chips in the surrounding soil. The life cycle is two years. Its nearest affinities are with the grape-vine root borers.

The meeting adjourned at 10.00 p. m.

Carl Geo. Siepmann,
Secretary.

Hypanthidium costatum (Spinola).—British Guiana: Onverwagt, January 10, 1936, one of each sex (J. Ogilvie). This certainly appears to be Spinola's (1841) *Anthidium costatum,* though the specimens are a little larger than Spinola's measurements. The species is noteworthy for the similar markings of the two sexes; both have the clypeus yellow (but no supraclypeal mark), and long lateral marks along the orbits. The markings of the head and thorax are nearly as in *H. taboganum* Ckll., male, but the tegulae have a large black spot in the middle. The seventh tergite of the male is formed practically as in *H. taboganum,* but is black with a broad yellow margin and a black pit in the middle of the margin. The broad yellow band on first tergite is rather narrowly interrupted; the band on the second has about the median third lacking. Tubercles with a yellow spot; mesopleura black, with a very small yellow spot in female. Legs black and yellow, the knees red.—T. D. A. Cockerell, Boulder, Colo.

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J. R. de la TORRE-BUENO, Editor
CARL GEO. SIEPMANN GEO. P. ENGELHARDT

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BULLETIN
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A CASE OF MISTAKEN IDENTITY AND DISCOVERY OF A NEW METAL MARK (CALEPHELIS) FROM MICHIGAN (LEPIDOPTERA, RHIODINIDAE).

By W. S. McAlpine, Birmingham, Michigan.

For many years in Michigan and nearby territory, a little metalmark butterfly has been mistaken for *Calephelis borealis* (Grote & Robinson).

Recently life history work on *Calephelis borealis* (Grote & Robinson) by Cyril F. dos Passos of Mendham, N. J., and on the Michigan *Calephelis* by the author, together with comparison of series of both butterflies and others in the same genus, has revealed that the Michigan *Calephelis* is not *borealis,* but apparently an undescribed species.

The author proposes the name of *Calephelis muticum,* for this species, after its food plant *Cirsium muticum,* the swamp thistle.

Calephelis muticum n. sp. (fig. 1 to 7 inc. Plate XX).

Male: Expanse holotype 1.00 inches, average of 29 paratypes 0.95 in., smallest 0.86 in., largest 1.03 in.

Upper surface: Head with a dark brown patch at top, balance of top and front fulvous (tawny, reddish, yellow, approaching orange), while palpi are of a slightly paler fulvous color. The eyes are dark purplish. Antenna black with white rings at joints, club rather long and faintly tipped with reddish brown.

Dorsal surface of thorax and abdomen fuscous (dark brown, approaching black) with lighter reddish brown scales along segmental sutures on sides of abdomen. There are fuscous scales along veins of both wings being more numerous on basal half of wings.

Upper surface of wings a rich bright mahogany color, clouded with fuscous at base of wings, along three fourths of costal margin (except at front base), and along inner margin

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of both wings. At front base of costal margin and front of patagia there is a dash of fulvous color. On the basal half of both wings there is a series of rather fine black linear markings which form four or five irregular transverse lines that are more or less concentric with base of the wings, giving that portion of the wings a darker appearance. In most specimens there are some fuscous scales preceding the most outward of the black transverse lines. These scales are more numerous on the forewing near center but the quantity of such scales is very variable in different specimens and in some examples are well scattered over basal half of wing. Beyond the outer transverse line are the two, rather fine, silver metallic lines, between which are a row of fairly prominent black dots. The metallic lines are margined with black, the outer line being continuous, close to, and equidistant from edge of the wings while the inner one is less continuous and more irregular, being considerably exserted at center of wings particularly so in forewings.The silver metallic lines though rather fine are well defined and conspicuous. In most specimens the ground color of the wings between the inner metallic line and edge of wing is of a lighter and brighter color.

Under surface: The legs and under surface of wings, thorax and abdomen are of a fairly uniform fulvous color. The basal markings which correspond in position with those that form the concentric transverse lines of the upper surface are quite fine and disconnected and are all of about the same weight.

The silver markings of the upper side are repeated, only are much heavier and have little or no black margins. The outer metallic line is continuous, while the metallic spots of the inner line are disconnected and somewhat round or square in shape, particularly on the primaries. There are three or four fine metallic markings along the costa preceding the inner metallic line. The dots between the two transverse metallic lines are repeated on the underside.

Female: Expanse allotype 1.00 inches, average of 13 paratypes 0.97 in., smallest 0.88 in., largest 1.05 in.

Very similar to male in markings and color of wings except that the markings are inclined to be heavier and the color a little deeper. The primaries are more rounded than in the male. The fringe sometimes has a very faint check of whitish at apex and inner angle of primaries. A trace of these spots is less often noted on male specimens.

A comparison of the three species, *muticum, borealis* and *virginensis* reveals that *muticum,* in both sexes, is very similar in markings, color and shape to *virginensis,* the main difference being in size. Small specimens of *muticum* which sometimes occur in nature are very difficult to separate from *virginensis* without examination of the genitalia. The color of the upper surface of *muticum,* in most specimens is darker than in *virginensis,* although this varies a great deal, and some specimens match well. *Calephelis virginensis* has the proportions of a smaller insect than either of the other species, while *muticum* averages slightly smaller than *borealis.* A series of specimens of *virginensis* averages male 0.79 in. in wing expanse, female 0.83 in., while a series of specimens of *borealis* averaged male 0.97 in. and female 1.06 in. and as noted before, a series of *muticum* averaged male 0.95 in. and female 0.97 in. in wing expanse.

Fresh specimens of *borealis* can usually be distinguished from either of the other species by the very dark and dull color of upper surface, which is covered with fuscous scales, there being usually a decided black transverse band across both wings near central area, preceding, and being part of, the outer basal transverse irregular line. The finer markings which form the other basal transverse lines are very obscure due to the fuscous scale covering of wings. This scale covering, except on the dark bands, is easily rubbed off, and flown specimens naturally appear lighter than freshly emerged ones. The silver markings of upper surface of *borealis* are faint and inconspicuous while the interspacial black dots are large and prominent. The ground color of wings of *borealis* is dark brown, and where rubbed yellowish, while fringes are also darker than in *muticum.* In *borealis* the fringes are usually faintly checkered with white at apex and inner angle of primaries, while this is not usually noticeable in *muticum,* and was not noted in *virginensis* at all.

The under surfaces of all three species are quite similar in color, although *borealis* is inclined to have a redder flush on outer primaries, particularly in male specimens. The markings of the inner metallic line of *borealis* are more connected, straighter and more crescent-shaped than in the other two species, while the costal fine metallic markings preceding the inner metallic line are subobsolete as noted by Grote & Robinson. In *borealis* the disconnected markings of the outer basal transverse line near center of wings, are heavier than the other basal markings and more continuous and prominent than in the other species.

The neuration of the three species is similar.

As noted in the illustrated figures the male genitalia are distinct in shape in the three species. The pointed end of the upper anellus in *muticum* easily separates it, while the armature of the harpé in *virginensis* is very different from the others.

Type localities: Willis, Washtenaw Co., Mich.; Mahopac and Bloomfield Hills, Oakland Co., Mich.; Champaign Co., Ohio; Willard, Missouri, and Milwaukee, Wis.

Types: Holotype male, Willis, Washtenaw Co., Mich., to be sent to U. S. National Museum; allotype female, Mahopac, Oakland Co., Mich. to be sent to U. S. National Museum. Fifteen male and two female paratypes from Willis, Washtenaw Co., Mich.; 8 male and 4 female paratypes from Mahopac, Oakland Co., Mich.; 1 male and 2 female paratypes from Bloomfield Hills, Oakland Co., Mich.; 3 male and 3 female paratypes from Willard, Missouri; 1 male and 1 female paratype from Champaign Co., Ohio, and 1 male and 1 female paratype from Milwaukee, Wis.

Part of these will be distributed to museums.

Calephelis borealis (G. & R.), according to Cyril F. dos Passos in Canadian Entomologist of August, 1936, is found on high ground, in open woods, along limestone outcroppings, where its food plant, *Senecio obovatus,* occurs. *Calephelis muticum* is found on low ground along spring fed streams, or in the swamps and bogs where its food plant, the swamp thistle, occurs. Nothing as yet is known regarding the life history of *C. virginensis.*

Calephelis muticum may have considerable range as its food plant is found from Florida to Texas in the south, to Saskatchewan and Newfoundland in the north, according to "Manual of the Southeastern Flora," by John K. Small, 1933, although an examination of so-called *C. borealis* series in several of the large Eastern museums reveal almost 100% of the specimens to be true *borealis,* usually from Virginia, Pennsylvania, New York, New Jersey, and southern Ohio, which would perhaps indicate that its range is rather limited after all.

Through cooperation of several Lepidopterists and museums, the present range of *C. muticum* is recorded. The author has seen and examined specimens of so-called *C. borealis* which have proved to be *C. muticum* from Chicago, Illinois, and Milwaukee, Wis., areas, in collection of Alexander K. Wyatt, of Chicago; and from Champaign County, Ohio, in collection of Ohio State University Museum, through courtesy of Mr. Edwin Thomas, and from Willard, Missouri, area, in collection of Dr. A. E. Brower, of Bar Harbor, Maine. *Calephelis muticum* has also been taken by several Lepidopterists in the Detroit area, Dr. W. W. Newcomb, Dr. Geo. W. Rawson, Sherman Moore, Walter Stinson and the author within a radius of thirty-five miles northwesterly and westerly from Detroit, Mich., where it has been found fairly common in certain small swampy areas. It has also been taken by the author in a Cass County tamarack swamp in the southwestern part of Michigan.

Dr. A. E. Brower sent me a series of thirteen *Calephelis* collected by him at Willard, Missouri, about the middle of August, 1926, which prove to be *Calephelis muticum.* He wishes to call attention to the erroneous recording of these as *Calephelis borealis* in his article in the Canadian Entomologist of April, 1929.

Dr. W. W. Newcomb recorded *C. borealis* from Michigan in his check list of Michigan Lepidoptera in the Fourteenth Report of the Michigan Academy of Science in 1912, but this also should be corrected to read *C. muticum.*

Mr. Robt. H. Wolcott published a list of Butterflies of Grand Rapids, Michigan, in the Canadian Entomologist of April, 1893, in which *C. borealis* is listed and mentions it as being found in low wet grassy areas near Lamberton Lake. Unfortunately, the whereabouts of Mr. Wolcott's collection is unknown, but there is little or no doubt that the species he refers to is *C. muticum.*

There is no authentic record of *C. borealis* for Michigan to my knowledge. The only present known apparent overlapping range of *C. borealis* and *C. muticum* is near Columbus, Ohio, where Mr. Edwin Thomas has taken *borealis* near Columbus and in the Cincinnati, Ohio, area under conditions similar to which Mr. dos Passos found it in New Jersey, and has also taken *muticum* in a cedar swamp in Champaign Co., Ohio, which is about 40 miles westerly of Columbus.

A comparison of life histories of *C. borealis* and *C. muticum* show they are quite similar in most respects, although the food plants and habitat as noted before are different. Both are single brooded.

C. borealis usually flies during the early part of July, while *C. muticum* flies during the latter part of July and early part of August. The egg, larval stages and chrysalis are very much alike in both species. The author made life history observations on *C. muticum,* believing he was dealing with *C. borealis* as far back as 1915 and 1916 and later on in 1930 and 1931 completed its life history. This detailed life history will appear in a latter issue of the BULLETIN.

The author is indebted to C. F. dos Passos who has given every assistance and has provided specimens of imago, egg, larvae in various stages and chrysalis of *Calephelis borealis* for comparison, to J. F. Gates Clarke and the National Munseum for aid in identification and loan of specimens., to the University of Michigan Museum for loan of specimens and literature, and to the Carnegie Museum, Dr. W. W. Newcomb, Geo. P. Engelhardt and Wm. J. Gertsch for assistance and gift or loan of specimens of allied species.

In the accompanying Plate I, the male specimen of *C. borealis* as figured is from Newton, N. J., which is close to the type locality "near Upper Coldenham, Orange, Co., N. Y.," while the female specimen as figured is from Rockview, Pa., not far distant. These agree very well with original description by Grote & Robinson as recorded in Annals of N. Y. Lyceum of Natural History, Vol. 8, p. 351, in 1866, and with series of specimens seen by the author in various museums and private collections. An effort was made to locate types or paratypes, but without avail. The figures of *C. virginensis* are from specimens in the Barnes Collection, U. S. National Museum, the same specimens being used by Barnes and McDunnough in their illustration of *C. virginensis,* Plate XII, figures 11 and 13, Vol. 4. "Contributions to the Natural History of the Lepidoptera of North America." These specimens also agree well with original descriptions and series of specimens examined by the author in various collections.

EXPLANATION OF PLATE I.

Figures actual size, except genitalia which are of a constant enlargement of twenty diameters.

Photos by Fenton Coombs, retouched by W. S. McAlpine.

Drawings by W. S. McAlpine.

Fig. 1. *Calephelis muticum* n. sp., upper side, ♂, holotype, Willis, Washtenaw Co., Mich., July 12, 1936 (W. S. McAlpine), U. S. National Museum.

" 2. *Calephelis muticum* n. sp., upper side, ♀, allotype, Mahopac, Oakland Co., Mich., July 24, 1932 (W. S. McAlpine), U. S. National Museum.

" 3. Same as Fig. 1, underside.

" 4. Same as Fig. 2, underside.

" 5. Neuration of *Calephelis muticum* n. sp., ♂, paratype, Mahopac, Oakland Co., Mich., July 24, 1932 (W. S. McAlpine), in author's collection.

" 6. Side view genitalia of *Calephelis muticum* n. sp., ♂, paratype, Willis, Washtenaw Co., Mich., July 12, 1936 (W. S. McAlpine), U. S. National Museum.

" 7. Top view with upper organs removed, genitalia of *Calephelis muticum* n. sp., ♂, paratype, Willis, Washtenaw Co., Mich., July 11, 1931 (W. E. Stinson), U. S. National Museum.

" 8. *Calephelis borealis* (Grote & Robinson), upperside, ♂, Newton, N. J., July 3, 1934 (C. F. dos Passos), in author's collection.

" 9. *Calephelis borealis* (Grote & Robinson), upperside, ♀, Rockview, Penn., July 12, 1936 (W. J. Gertsch), in author's collection.

" 10. Same as Fig. 8, underside.

" 11. Same as Fig. 9, underside.

" 12. Top view with upper organs removed, genitalia of *Calephelis borealis,* ♂, Rockview, Penn., July 12, 1936 (W. J. Gertsch), in author's collection.

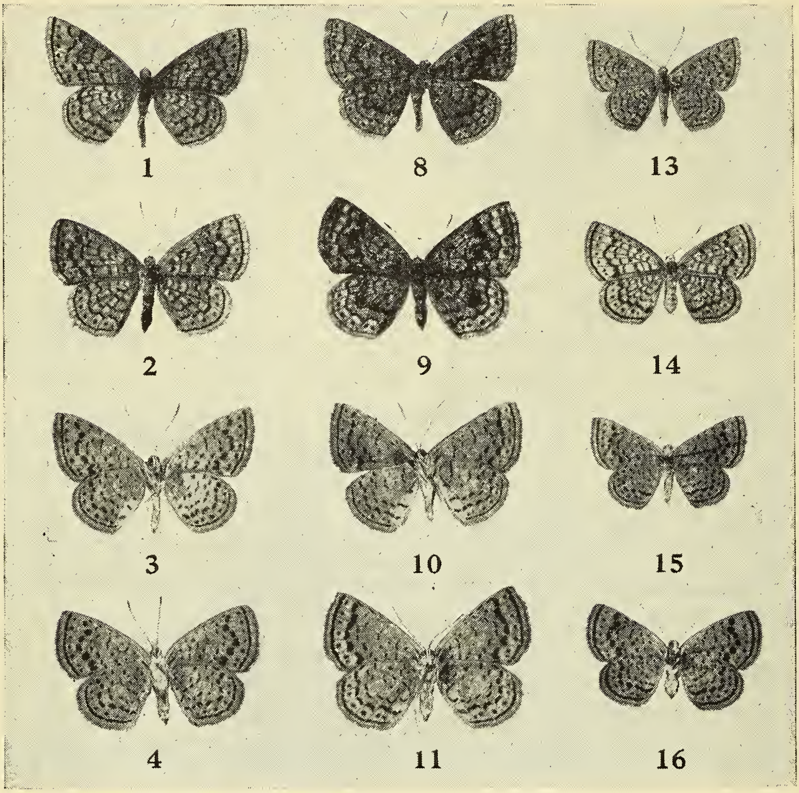
" 13. *Calephelis virginensis* (Gray), upperside, ♂, Fort Meyers, Fla., Apr. 16, 1923 (Barnes Collection), U. S. National Museum.

" 14. *Calephelis virginensis* (Gray), upperside, ♀, Fort Meyers, Fla., May 1, 1907 (Barnes collection), U. S. National Museum.

" 15. Same as Fig. 13, underside.

" 16. Same as Fig. 14, underside.

" 17. Top view with upper organs removed, genitalia of *Calephelis virginensis,* ♂, Fort Lauderdale, Broward Co., Florida, Aug. 22, 1925 (D. M. Gates), in author's collection.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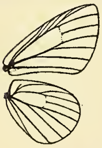
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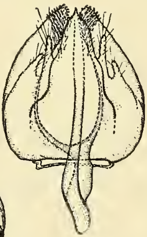
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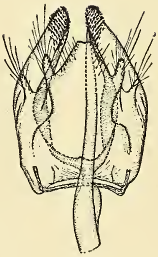
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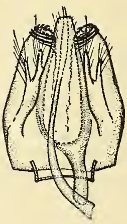
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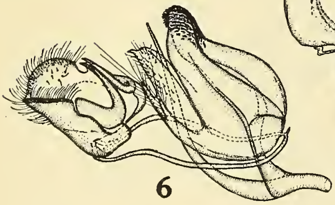
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OUR MORPHOLOGICAL TERMS AND INTERPRETATIONS.

By Philip Levereault, Entomology Department,
Kansas University, Lawrence, Kans.

The present is not a most fortunate time for the presentation of critical analyses of currently acceptable conceptions and usages. It is a time of disruption; there is confusion in every field of endeavor. During such a period the older try to maintain the *status quo,* and the younger, made suspicious by the resistance to the inevitable, question the *status quo,* and usually find it inadequate and undesirable. The conflict is not so sharply defined in entomology as it is in political economy, but entomology is not isolated from current trends of thought.

Snodgrass gave a strong impetus to a fundamental revision of our conception of insect structure. His work has stimulated younger students to think carefully, as he hoped, "It is more than likely, practically certain, that many of the generalizations here offered will soon be modified or superseded by other generalizations, but they will have served their purpose if they induce critical students to make a wider and more thorough study of the problems of insect morphology,"[1] It will not be long before these critical students will produce their analyses; during the past year some investigators have shown their dissatisfaction with our morphology in their publications.

This particular analysis of our insect morphology deals with our terms and interpretations for the insect skeleton, since this system of structure is of greatest interest to entomologists. The other systems of structure are by no means free of bad interpretations and terms, but since they have not been studied so extensively, our state of knowledge concerning them is not so confused.

Bad terms and interpretations? Yes, not only bad terms and interpretations but also unnecessary frills. It seems odd that men who study with systematic thoroughness should use language in such a way that the reader must "understand" what is meant by the use of certain wordings, especially when such conditions are not necessary. One of these "understandings" is the status of the insect skeleton. We know it is derived from the chitinous cuticula, a product of the ectoderm. The insect skeleton, then, is an external or *exoskeleton.* If it is an exoskeleton it cannot be also, in part, an endoskeleton, if the term endoskeleton is to have any meaning concerning the basic differences between supporting structural systems of vertebrates and invertebrates. And, after all, entomology is a part of zoology.

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[1] R. E. Snodgrass, "Principles of Insect Morphology," Preface, end of first paragraph.

We know that the inner features of the insect skeleton are derived by invaginations and inflections of the cuticula, not from an inner embryonic layer. Then, why do we say that an insect has an "endoskeleton" as well as an exoskeleton? What do we gain by terming these apophyses, ridges, extensions (tendons) collectively as the "endoskeleton"?

Another "understanding" we have at present is the relationship of the skeleton to the metamerism or trunk segmentation of the insect. The insect somite is a subdivision of the trunk, and as such it has parts of other systems of structure as well as of the skeleton. Yet, we speak of "the head" of an insect and refer to the skeleton of the cephalic somites! Just what do we gain by "understanding" that in insect morphology "the head" means the skull, and not necessarily the entire body region?

From the point of view of a younger student such "understandings" in the science of his choice are not desirable. The skeleton of the cephalic somites of the generalized insect is a skull-like structure. Though this skull is not homologous to the vertebrate skull, its functional similarity permits a comparison, and I think it would not be too amiss to call the insect skull the insect *cranium.* This term would have more specific significance to the elementary student than "head capsule," "epicranium," etc.

The earlier entomologists looked upon the insect cranium as a composite of sclerites and appendages. Such a point of view persisted probably because of a consideration of the insect skeleton as "external anatomy" in too literal a sense. Observations must have been limited to two dimensions, for if the fact that the insect skeleton is a continuous envelope (broken only at the stomodeal, proctodeal, and tracheal openings) had been kept foremost in mind, the idea of sclerotized cuticular plates placed together to form the insect cranium would have appeared at least awkward. The morphologist must keep three dimensions in mind when he interprets animal structure.

The head of a generalized insect appears to be a fused product of at least four, if not six, somites. The cuticular dorsa of these somites have become highly developed, indistinguishable, and strongly sclerotized. They, with the prestomal flap, form the *epicranium* (see figures 1, 2, 3), the upper portion of the skull. The cuticula of the poststomal cephalic appendages, and of the ventra of the poststomal cephalic somites forms the *gnathocranium*, the jaw region.

The epicranium is fundamentally of two pieces, in the generalized insect, the prestomal flap and the crown of the skull. The prestomal flap is the cuticula of the prestomium. It is a folded flap, with an outer surface which usually has a sclerite, and an inner surface with no definite sclerites but with sensory structures. The sclerite of the outer surface is called the "labrum," and the inner surface is the "epipharynx." But, we tell our elementary student the labrum is the upper lip! How fortunate it is our elementary student does not often "think through" his course work!

Obviously it is not for the best purpose to have one term for two structures of unequal value. I suggest we retain the term *labrum*, but that we use it for the entire prestomal flap, the upper lip. Then, the sclerite of the labrum should be the *labrite* (Lbt, figures 1, 2, 7). We should discard the term "epipharynx," since this surface of the labrum is hardly above the pharynx in the generalized cranium. As for the "tormae" we would gain more by sacrificing brevity, in this case, for a name indicating their function, the important feature of these lateral tongues of the labrite. They are the bases for the posterior labral muscles.

It may have been noticed I did not say the labrum was *attached* to the crown of the skull. Students have been told that parts of the insect skeleton are attached to one another so that the insect skeleton must appear to the students as prefabricated. However, this is no mere matter of spinster fussiness, but a serious matter of using words properly enough to lead the students into accurate conceptions. Good choice of wording enables the students to gain sharper conceptions of insect structure as well as of other subjects.

It is not true that the epicranium is composed of paired and median plates attached to each other. The epicranium is composed of the fused and sclerotized dorsa of the cephalic somites. This fusion and sclerotization is the main feature of the epicranium, the basis for all the various types of insect crania.

Though the sclerotization of the epicranium is usually highly developed, there are two types of supporting features to render the skull more rigid, cuticular inflections which form inner ridges, and invaginations which form apophyses or struts.

The cuticular inflections of the epicranium conform to a fundamental plan. There is one major inflection, the *submarginal infolding*. This feature is not new to our knowledge; it merely has not been recognized. We have been examining the crania of various insects for "epistomal," "pleurostomal," "hypostomal," and postoccipital sutures, but we have not recognized these lines as parts of a continuous submarginal inflection. This is not the first time the significance of major features has been overlooked by scientists because they were too engrossed in details.

The cricket epicranium is a good form for the study of the submarginal infolding (turn to figures 5, 6). In this insect the "epistomal" infolding (sfr s) is rather suppressed, but no morphologist will deny that this inflection generally crosses the facial area and extends into the anterior "tentorial" invaginations (atp). From these unusually wide invaginations the submarginal inflection crosses the genal areas, forming the so-called "pleurostomal" infoldings (sge s). From the points of the posterior mandibular articulations the submarginal inflection continues posteriorly as "hypostomal" infoldings (soc s), which merge with posterior "tentorial" invaginations (ptp). Between these invaginations is the overarching postoccipital infolding (poc s). Are not all these infoldings but portions of a continuous inflection just within the margins of the epicranium? This continuity is apparent not only in the cricket, but in all generalized orthopteroid crania.

The second important epicranial inflection is the *occipital* (occ s, figures 2, 3). It forms an arching rib about the posterior portion of the epicranium. Also of secondary importance are the *antennal* (ant s, figure 1) and the *ocular* (ocl s) inflections. The ocular inflection separates off the cornea of the compound eye, and in some instances the inner ridge of this inflection is considerably developed.

A peculiar feature in many insects is the distribution of ommatidia to the corneal facets. Not all of the facets of the cornea are in contact with ommatidia. The peripheral facets are unoccupied, forming a transparent band about the pigmented area of facets in contact with ommatidia. Even competent morphologists have interpreted this band as the "ocular sclerite," as a sclerotic band defined by two inflections about the cornea! A razor-section reveals that the "ocular sclerite" of the grasshopper (and other orthopteroids) is merely an optical illusion.

In addition to the major and secondary inflections, there are infoldings of but minor importance, peculiar to certain forms, as the temporals of mantids, "suboculars" of crickets, "subantennals" of roaches, etc.

It is these inflections, major, secondary, and minor, which are responsible for the subdivisions of the epicranial sclerotization into the various sclerites. If we keep in mind the relationships of these sclerites to the cuticular inflections, we will not be so likely to think of the insect epicranium as something of an igloo, formed by the proper arrangement of paired and medial plates. The epicranial sclerites are subdivisions of a secondary sclerotic condition. The lines of subdivision are those of inflections, with the exception of the moulting line, the epicranial suture (epc s. figure 1— it should not be considered as consisting of the median "coronal" plus the lateral "frontal" sutures, but as a single λ-shaped feature).

There are six main epicranial sclerites, four of which are paired. The crown, or vertex, of the epicranium is divided into a pair of *epicranial sclerites* (Epc, figures 1, 2, 3) by the epicranial suture. These sclerites have been called the "parietals," but parietal is from the Latin word for wall, not a very specific designation.

Below, or morphologically anterior to the epicranial sclerites is the *frontal* sclerite (Frn). Laterad of the frontal are the *genal* sclerites (Ge), and posterior to these is the *occipital* sclerite (Occ, figures 2, 3). Why we have not been questioned by our students concerning our definition of the occipital sclerite I do not know. Comstock and MacGillivray taught many an entomologist that the supraforaminal part of this sclerite is the "occiput," and the lateral portions are the "postgenae." We have since recognized the fact that "occiput" and "postgenae" are parts of essentially a single sclerite, but for some singular reason we have not fully recognized our reinterpretation.

Of the six main epicranial sclerites four are subdivided by the submarginal inflection. From the frontal sclerite the submarginal infolding separates the "clypeus," *Sfr,* figures 1, 2 (clypeus is the Latin for a small round shield!), from the genal sclerites the "pleurostoma," *Sge* (which are not ribs about the mouth!), and from the occipital the "hypostoma" (Soc, figures 2, 3) and the postocciput (Poc). Would it not be preferable to recognize these subdivisions as being related to the main sclerites, that the *subfrontal* sclerite is a subdivision of the frontal, the *subgenals* of the genals, and the *suboccipitals* of the occiptal?

The second type of epicranial support, the invagination, forms a ventral brace to the epicranium. This brace has been called an "endoskeleton of the head," and a "tentorium." It is neither. It is an elaboration of four points of the submarginal inflection (see figure 6), and it is essentially a part of the ectodermal cuticula; further, it is a brace, not a tent. In place of the older terms I suggest we name the brace the *transtrum,* Latin for cross-brace.

The form and function of the generalized insect tongue is so obvious that it is hard to understand why some Latin or Greek word for tongue has not been used for the structure. The word "hypopharynx" is a misnomer, for the organ (Gl, figure 7) is not below the pharynx. I suggest we discard this long "hypopharynx" for the briefer and less misleading *glotta,* the Greek for tongue.

The antennae are outgrowths of the cheek areas. Whether these appendages are true metameric appendages, or not, cannot be ascertained from the present state of our knowledge. The adult antenna appears to be, from structural analysis, more like a prestomal tentacle than a true metameric limb. The generalized antenna has three segments, in spite of appearances. The basal segment (I, figure 1) articulates with a finger-like process of the antennal inflection, the *antennifer.* This basal segment is usually called the "scape," a word from the Latin for shaft or stem. The intermediate segment is more grotesquely named the "pedicel," the Latin diminutive for foot! This intermediate antennal segment is moved by a pair of muscles extending from its base to the basal segment, a condition which permits us to maintain that the basal and intermediate segments are primary divisions. The third segment has no muscles, but the line of demarkation between this distal segment and the intermediate induces us to recognize it as a primary division. In addition, the annulation, or subsegmentation of the distal segment is an important characteristic. We should recognize these subdivisions not only in our drawings, but also in our terminology. Such terms as "brachymeres" and "dolichomeres" are not desirable.

If we are to recognize the morphological difference between the head and cranium, we should be careful in our discussions to distinguish between the skeletal portion of an appendage and its morphological entirety. I do not think it necessary to have a special term for the appendicular skeleton, as we have for the head skeleton, but I do wish to emphasize that a mandible is not merely the masticatory cone of an orthopteran; it has its muscles, nerves, etc.

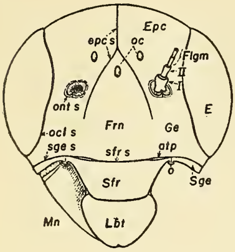
Since the mandibular skeleton is not highly differentiated regionally (see figure 8) not many inappropriate terms have been used for its description in its generalized state. In this state the mandibular skeleton is more or less conical, with distal *incisor processes* (in p) and mediobasal *molar processes* (m p). Various names have been applied to the articulatory points, but Snodgrass's *anterior mandibular* (a) and *posterior mandibular* (b) articulatory points are more satisfactory, if the student is made aware of the fact that *anterior* and *posterior,* in this case, are morphological in position and not necessarily dependent upon the orientation of the head of any particular insect.

The maxillary skeleton is more highly differentiated than the mandibular (see figure 4), and our terms for the maxillary sclerites are not beyond reproach. The *cardo* (Cd) is a good term, as is the *stipes* (Stp). However, we should not use "parastipes" for the medial portion of the stipes separated by the *stipital inflection* (stp s). The tendency to use a term for every marked-off portion of the insect skeleton often lends a touch of the superficial to observation, for if one has a thorough understanding of the structure of the insect skeleton he does not need so many terms. In the case of the maxillary stipes it is enough to indicate there is a stipital inflection. Naturally, variations in the mode of inflection will give the stipes various forms, but, morphologists must delineate their observations, and drawings are more effective than descriptions loaded with names; at least they should be.

Distad of the stipes are two endite lobes, the "lacinia" and "galea." Lacinia is from the Latin for lappet, or the turned up edge of a garment. In the generalized insect this maxillary lobe looks more like a tong than a lappet, and I suggest that maxillary *forceps* be substituted for lacinia (see Fcp, figure 4). Galea is the Latin for helmet or head-piece, yet this lobe (Plx) looks more like a sack, or even a thumb. I think it would be easier for the elementary student to remember this lobe as the maxillary *pollex* than as the "galea."

Concerning the labial skeleton, we are not certain of the homologies of the basal sclerites, but I am certain that many of our labial terms are not to our advantage. The basal sclerite may have included in its composition a part of the sternum of the third postoral somite as well as the united cardines, but the sclerite is a chin plate, and as such, should be designated as the *mentum* (Mt, figure 9). A subdivision of this plate would be, then, a *submentum* (Smt). At the present time some of us call the main portion of the chin plate "submentum," and the subdivision "mentum"!

Distad of the mentum we note six structures which have received numerous names, names which are no credit to us as scientists. We have admitted for many years that the labial skeleton is fundamentally homologous to the maxillary, yet we have not been consistent enough to recognize our interpretation in our terminology. If we realize that the labial palps (Plp, figure 9), homologous to the maxillary palps, are borne by sclerites homologous to the maxillary stipites, why have we not recognized these labial equivalents as the labial stipites (Stp)? "Mentum," "prementum," "prelabium," etc., do not indicate the homology. Further, the endite lobes of the labium are called "glossae" and "paraglossae," in spite of the fact they have little in common with tongues. They are homologous to the endite lobes of the maxillae, and should be called the labial *pollices* (Plx), and *forcipes* (Fcp).


Epc
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Mn
Lbt

Fig. 1

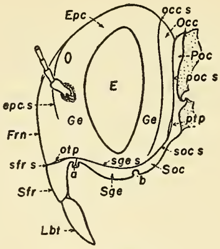
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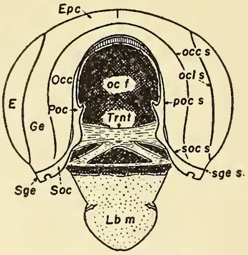
Fig. 2


Epc
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Soc
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Fig. 3

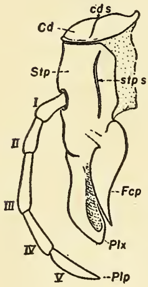
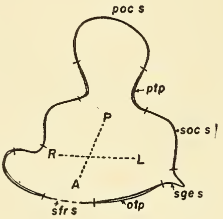

cd s
Cd
Stp
stp s
I
II
Fcp
III
IV
Plx
V
Plp

Fig. 4


poc s
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P
soc s
R
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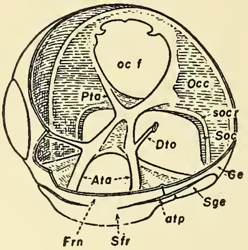
sge s
sfr s
otp

Fig. 5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Frn
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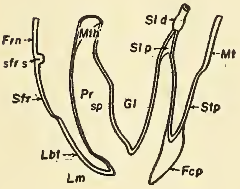
Fig. 6


Frn
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Lm
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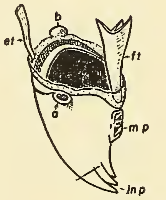
Fig. 7


b
et
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in p

Fig. 8

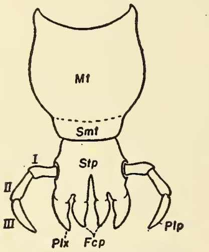
Mt
Smt
I
Stp
II
III
Plp
Plx
Fcp

Fig. 9

EXPLANATION OF FIGURES.

Fig. 1.	Facial view of generalized cranium.
Fig. 2.	Lateral view of same.
Fig. 3.	Posterior view of same.
Fig. 4.	Posterior surface of left maxilla of generalized pterygotan.
Fig. 5.	Diagram of submarginal inflection of cricket cranium.
Fig. 6.	Inner surfaces and transtrum of cricket epicranium.
Fig. 7.	Diagram of gnathocranium for median plane.
Fig. 8.	Diagram of right mandible of generalized pterygotan.
Fig. 9.	Posterior surface of labium of generalized pterygotan.

ABRREVIATIONS.

A	anterior.
a	anterior mandibular articulatory point.
ant s	antennal suture.
Ata	anterior transtral arm.
atp	anterior transtral pit.
b	posterior mandibular articulatory point.
Cd	cardo.
cd s	cardinal suture.
Dta	dorsal transtral arm.
E	cornea of compound eye.
Epc	epicranial sclerite.
epc s	epicranial suture.
et	extensor tendon.
Fcp	forceps.
Flgm	flagellum.
Frn	frontal sclerite.
ft	flexor tendon.
Ge	gena.
Gl	glotta.
in p	incisor processes.
L	left.
Lb m	labral membrane.
Lbt	labrite.
Lm	labrum.
Mn	mandible.
m p	molar process.
Mt	mentum.
Mth	mouth.
oc	ocelli.
Occ	occipital sclerite.
occ s	occipital suture.
oc f	occipital foramen.
ocl s	ocular suture.
P	posterior.
Plp	palp.
Plx	pollex.
Poc	postoccipital sclerite.
poc s	postoccipital suture.
Pta	posterior transtral arm.
ptp	posterior transtral pit.
Pr sp	preoral space.

R	right.
Sfr	subfrontal sclerite.
sfr s	subfrontal suture.
Sge	subgenal sclerite.
sge s	subgenal suture.
Sl d	salivary duct.
Sl p	salivary pocket.
Smt	submentum.
Soc	suboccipital sclerite.
soc r	suboccipital ridge.
soc s	suboccipital suture.
Stp	stipes.
stp s	stipital suture.
Trnt	transtrum.

CHANGE OF NAME IN DIPTERA. I wish to propose the name *Feltomyina* nom. nov., to replace *Feltomyia* Alexander (Bull. Brooklyn Ent. Soc., 31: 12–13; 1936), preoccupied by *Feltomyia Kieffer* (Genera Insectorum, Cecidomyiidae, Fasc. 152: 100; 1913). Both Dr. Felt and Dr. Johannsen have called my attention to the fact that the name was preoccupied.

It should be noted that the name *Feltomyia* Kieffer was not given in the indices of new names in either the *Zoological Record* or the *International Catalogue of Scientific Literature* and this omission contributed in part to my overlooking the prior name. This failure of the collaborators of the important catalogues mentioned to list the name *Feltomyia* must be blamed entirely on the unfortunate manner in which Kieffer proposed the term, there being no indication that the name was being proposed as a new genus.

Charles P. Alexander,
Amherst, Mass.

A NOTE ON NEST-FOUNDING IN THE BUMBLEBEE, BREMUS AMERICANORUM.

By Phil Rau, Kirkwood, Mo.

Frison* tells us that "although fighting among the bumblebee queens in spring over nesting sites is not confined to any one species, *B. americanorum* is a species much addicted to this habit." Since the habit of usurping nest and brood of a sister queen has all the earmarks of incipient social parasitism, I think it sufficiently important to record one more instance of this behavior. An abandoned wren's nest in a large tin can had attracted a queen of *B. americanorum.* The can with the open end facing east was on a shelf in my open shed and for several days was the center of interest of this large queen; on June 23, 1935, I saw her actually going into the center of the mass of sticks and straws. A few days later, however, there was a dead queen on the outside of the nest. For the moment I had forgotten about the combat-behavior between queens, and thinking that the dead one was the original queen I proceeded to open the nest. While doing so a loud buzz about the can told me that I had opened the nest too soon; however, I could not tell if this returning queen was the original one or the usurper, but at any rate the evidence pointed to the fact that murder had been committed.

In opening the nest I found that the brood cells were placed half inch beneath the soft bed of feathers. There were no worker bees present but there were five sealed cells containing larvae; in the center of these was a sixth cell, quite large in comparison, not sealed and empty, divided by a diagonal wall into two sections. At various places about these cells were irregular masses of brown sticky material which I took to be bee-bread. In picking away at this bee-bread, I discovered three shallow irregularly shaped cups, each containing either eggs or very young larvae. Some of the latter were actually seen eating the walls of their prison. One cell had four young larvae, another had three still smaller ones and an unhatched egg, and also the three shriveled egg-shells from which the larvae had hatched; the last cell had only a newly laid egg.

While the queen was buzzing about, I quickly replaced the cells among the feathers and put the can where it originally had been; after a great deal of agitation, the queen flew into the can and scrambled to her nest. However, to my disappointment, I found she deserted the nest the next day and never returned to it.

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* Ann. Ent. Soc. Amer. *23*: 663, 1930.

NEW NORTH AMERICAN MUSCOID DIPTERA.*

By H. J. Reinhard, College Station, Texas.

The new flies described below are mainly from collections received for determination during the past few years and the descriptions are published at this time to permit the return of borrowed material. The types have been deposited in various collections and the location of each is mentioned under the description. The first two species characterized herein belong to the family Stephanostomatidae (Sarcophagidae Auct.) and the remainder to the family Tachinidae.

Johnsonia borealis n. sp.

Female: Front at extreme vertex 0.31 of the head width (two specimens) and widening but slightly downward, in profile rather prominent or bulged above base of antennae; parafrontals and parafacials gray pollinose, beset with short black hairs; frontal bristles strong, about seven in number stopping at base of antennae, anterior four pairs directed inward, the rest reclinate; a single proclinate fronto-orbital bristle situated close to frontal row; ocellars rather weak but distinct; inner verticals stout and suberect, outer pair not developed; frontal vitta dark brown, wider than parafrontal on upper half; antennae black, third segment tinged with red basally, about twice the length of second; arista brown, long plumose to apical third or beyond; face moderately excavated and receding, gray pollinose; parafacial on narrowest part a trifle wider than third antennal segment; vibrissae stout, decussate, situated on oral margin well above lower border of head; proboscis short; palpi black, hardly thickened apically; cheek gray pollinose, about one-sixth the eye height, bearing a row of well-developed inwardly curved bristles near lower edge with one near middle slightly longer than the rest; back of head convex, entirely covered with dull gray pollen and beset with rather coarse black hairs intermixed with a few fine pale ones on the lower extremity.

Thorax gray pollinose, with three subshining black stripes, outer two broad, median one much narrower but well defined in front of suture; prescutellar bristles small but distinct; dorsocentral 2, 3 (one specimen with four behind suture);

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[*] Contribution No. 381 from Division of Entomology, Texas Agricultural Experiment Station.

sternopleural 0, 1; scutellum black, bearing two lateral, besides one or two subapical pairs; infrasquamal hairs present; propleura and prosternum bare.

Abdomen ovate, hardly wider than thorax, black except anal segment which is wholly red; upper surface rather shining but dusted with thin changeable gray pollen over most of first segment and on broad basal margins of the three following ones; first two segments with only lateral bristles, third and fourth each bearing a marginal row; anal opening large, first genital segment red, beset with fine black hairs on apical margin, larvipositor blackish.

Legs black, stout and rather long; middle tibia with two anterodorsal bristles; claws and pulvilli shorter than apical tarsal segment.

Wings subhyaline, rather narrow and extending well beyond apex of abdomen; first, third and fifth veins setulose; apical cell narrowly closed at costa well before wing tip; hind cross vein joining fourth distinctly nearer bend than small cross vein; costal spine developed but rather short; epaulets black.

Length, 8 to 10 mm.

Described from two female specimens. Holotype, Hamburg, Michigan, June 3, 1934 (George Steyskal); paratype, Brownhelm, Ohio, August 14, 1916 (H. J. Reinhard). Holotype in the University of Michigan Museum, Ann Arbor, Michigan.

The single sternopleural bristle readily distinguishes the species from the known forms, which are all tropical or subtropical in distribution.

Sarcofahrtia femoralis n. sp.

Male: Front narrowed before triangle, measuring 0.15 of the head width in both specimens; parafrontals and parafacials silvery pollinose, the former narrowed, bearing sparse short hairs outside of frontal rows; median stripe dark brown, much wider than one parafrontal except at anterior extremity; inner verticals suberect, outer pair vestigial; ocellars present; frontal bristles extending to base of antennae; parafacials with an irregular row of black hairs, distinctly narrower than third antennal segment; face moderately impressed, gray pollinose, its ridges with a few hairs above vibrissae; antennae about three-fourths length of face, wholly reddish yellow, third segment hardly twice as long as second; arista brownish black, thickened on basal fourth, clothed with short hairs to apical third or beyond, proximal segments short but distinct; vibrissae almost on level with oral margin; proboscis short, black; palpi reddish yellow, hardly at all thickened apically; cheeks blackish dusted with gray pollen, fully one-fourth the eye height; back of head convex, plumbeous, clothed with black hairs only.

Thorax and scutellum black, gray pollinose; mesonotum showing three broad black stripes when viewed from the rear. Chaetotaxy: acrostichal 0,1; dorsocentral 2,3; humeral 3; posthumeral 1; presutural 1 (outer); notopleural 2; supraalar 3; intraalar 3 (anterior one small, situated well behind suture); postalar 2; sternopleural 1,1; scutellum with one discal and three pairs of lateral bristles, no apicals between hindmost pair of latter; prosternum and propleura bare; infrasquamal hairs present; calypters white.

Abdomen black, genital segments bright reddish yellow; first segment with a small silvery spot on either side above, the three following each with four larger basal silvery spots which in a favorable view appear united except along the median line; venter wholly shining black; basal segments without median marginals, each bearing two or three bristles on the lateral hind margin; third also with three lateral marginals besides a median marginal pair; fourth bearing a complete marginal row; first genital segment with row of six good-sized bristles situated on a rounded ridge near base above; second segment strongly convex behind and clothed with fine black hairs; forceps black tapering to an acute tip in profile, divided but only slightly divergent when viewed from behind; accessory plate yellow, rather slender or fingerlike, bearing longish hairs on the hind margin, tip oblique and emarginate; posterior clasper of ordinary length, tapering to tip; anterior clasper broad and flattened to middle, thence curved forward and greatly narrowed terminating in an evenly bowed hook; penis apparently jointed near base; distal segment yellow, rounded but not thickened at the emarginate tip, bearing a large forwardly directed pale membranous structure on the front side near middle; fifth sternite undivided, with a prominent projection at middle of hind margin, reddish black.

Legs black; hind femur rather strikingly bowed near basal third and bearing a blunt tooth near base on inner side, noticeably thickened; hind tibia also bowed, slightly shorter than femur, beset with hairs of which the longest barely exceed the width of tibia; one stout and two smaller bristles on outer front side of middle tibia; claws and pulvilli elongate.

Wings subhyaline, with a faint brownish tinge; venation normal; first vein bare, third setulose nearly half way to small cross vein, which is infuscated; costal spine small; epaulet reddish.

Length, 8.5 mm. Female not known.

Described from two specimens, Electron, Washington, June 26, 1933 (J. Wilcox). Holotype in my collection.

The thickened and bowed hind femora readily distinguish the species from the genotype, *S. ravania* Pkr., which differs further in having four sternopleurals, and in the structure of the male genitalia.

Dexodes tenella n. sp.

Close to *D. nana* Curr., but readily distinguished by the following characters: third antennal segment three to four times longer than second; parafacials almost linear below; abdomen more pointed apically, middle segments with sharply defined pollen bands and shining black above on broad posterior margin; first posterior cell closed and short petiolate.

Male: Front at vertex barely exceeding one-half the eye width, widening rapidly on anterior third; parafrontals gray pollinose, sparsely haired outside of frontal rows, median stripe blackish, at middle about as wide as one parafrontal; ocellar bristles small but distinct, proclinate; frontals descending to level of arista, upper three pairs reclinate but not very long; inner verticals suberect, outer pair vestigial; face gray pollinose, moderately excavated, its ridges with a few bristly hairs on lower extremity; parafacials bare; antennae black, reaching almost to oral margin, third segment about four times length of second; arista black, bare, with short basal segments, thickened on proximal fourth; vibrissae situated on level with oral margin; proboscis short; palpi yellow; cheek about one-sixth the eye height, clothed with black hairs; eyes bare.

Thorax and scutellum black, dusted with gray pollen, mesonotum indistinctly vittate. Chaetotaxy: acrostichal 3,3; dorsocentral 2,3; intraalar 3; supraalar 3; postalar 2; notopleural 2; presutural 2 (inner one small); posthumeral 1; humeral 2; pteropleural 1 (small); sternopleural 2,1; scutellum with one discal and three lateral pairs, no apicals present; calypters semitransparent, white.

Abdomen slender and tapering to apex, black with the anterior lateral margin of second segment obscurely reddish;

first segment wholly shining above, with a pair of median marginal bristles; second segment also bearing median marginals, besides a pair of discals; third with a discal pair and a marginal row of about eight strong bristles; fourth bearing a marginal and a discal row, the latter irregularly spaced; genitalia black, small and retracted.

Legs black; claws and pulvilli a little shorter than apical tarsal segment; middle tibia with one bristle on outer front side near middle; hind tibia not ciliate.

Wings hyaline; fourth vein with an oblique rounded bend joining third which reaches costa a little before extreme wing tip; first vein bare, second with two or three hairs at base; hind cross vein meeting fourth a trifle nearer bend than small cross vein; costal spine small.

Female: The single specimen teneral and not in good condition. Front somewhat shrunken but apparently about two-thirds the eye width; two pairs of proclinate fronto-orbitals; outer verticals hardly one-half as long as inner pair; third antennal segment about three times length of second; claws and pulvilli short; genitalia not fitted for piercing.

Length, 4 to 4.5 mm.

Described from two male specimens and one female specimen received from A. J. Basinger, labeled "Carlsbad, Cal., July, 1933. Ex. potato tops with tuber moth, A. J. Basinger, Collector." Holotype, male, in Mr. Basinger's collection.

Ernestia solita n. sp.

Parafacials bare and hardly wider than third antennal segment. Abdomen bearing well-developed discals on segments two and three. Close to *E. nigrocornea* Toth., but the male genital forceps are distinctly narrower and shorter, and the second antennal segment is wholly red in female.

Male: Front moderately prominent in profile, width on narrowest part (before ocelli) slightly exceeding the length of second antennal segment; parafrontals and parafacials with dense grayish white pollen; frontal vitta dark red, wider than one parafrontal; ocellar bristles normal in size, proclinate; inner verticals well developed; frontal rows strongly divergent below and extending beneath middle of second antennal segment; face receding with the lower edge strongly produced between the vibrissae; antennae four-fifths the length of face, third segment black, not much longer than wide, apex subtruncate; arista thickened on proximal three-fifths, middle segment three or four times longer than thick; vibrissae slightly above front border of oral margin; cheek blackish and dusted with thin gray pollen, about two-fifths eye height; palpi yellow; eyes thickly haired; back of head gray pollinose, clothed with pale hairs intermixed with black ones on upper margin.

Thorax black, lightly dusted with gray pollen; mesonotum subshining and showing no well-defined vittae; chaetotaxy essentially as in *E. nigrocornea,* but the inner presutural bristle is distinctly developed and sometimes there are four sternopleurals present; scutellum reddish on apex, bearing four large lateral bristles besides a small decussate apical pair; no infrasquamal hairs; calypters opaque, white.

Abdomen black with sides of intermediate segments sometimes tinged with red; last three segments gray pollinose on basal third to half, remainder of each including the first shining black; basal segment without median marginals, second with one pair; third segment with a marginal row of about ten; fourth with an irregular discal row besides the usual row of marginals; genitalia blackish; inner forceps without a keel at base behind, united and slender, slightly bowed forward at the apex; outer forceps thin when viewed from behind, in profile triangular, terminating in a minute hook; fifth sternite black, with a narrow V-shaped incision extending beyond the middle, posterior edge of lobes emarginate.

Legs black; middle tibia with a row of stout bristles on outer front side; hind tibia bearing a row of uneven bristles on outer posterior side and about four equally large ones on the inner posterior edge; claws and pulvilli about as long as fifth tarsal segment.

Wings gray hyaline; fourth vein with an angular bend bearing a short stump; apical cell open far before wing tip; hind cross vein bicurved, joining fourth hardly one-third the distance from bend to small cross vein; third vein bearing three to five hairs at base; costal spine well developed.

Female: Width of front at vertex nearly twice the length of second antennal segment; two proclinate fronto-orbitals; outer verticals developed, curving outward; abdomen and genitalia black; claws and pulvilli short.

Length, 8 to 10 mm.

Sixteen specimens as follows: 3 males (including holotype) and 4 females, Detroit, Michigan, May, 1933 (Geo. Steyskal) in Mr.

Steyskal's collection; 2 males and 1 female, Agr. Coll., Michigan, May, 1922 and 1923 (L. G. Gentner), in my collection; 1 male and 1 female, from New York, Ringwood, Ithaca, June 5, 1923 (L. S. West) and Thatcher Pk., Hildeberg Mts., Albany, May 29, 1920, no collector's label; 1 female, Mes Bleue, Ont., Canada, June 22, 1918, without collector's label, all in the Cornell University collection; 3 males in K. V. Krombein's collection, labeled Oswego, N. Y., May 8 and 12, 1936 (K. V. Krombein). Holotype in the University of Michigan collection, Ann Arbor, Michigan.

Zenillia mathesoni n. sp.

Facial ridges bristled on lowest third to half as in *Z. lobeliae* Coq. but at once distinguished by the wider front, presence of fronto-orbitals and short claws and pulvilli in the male. The eyes are sparsely short-haired and the intermediate abdominal segments beset with coarse erect hairs above but with no distinct discals.

Male: Front at vertex 0.316 of the head width (average of five: 0.31, 0.31, 0.32, 0.33, 0.31); parafrontals with dull gray to yellowish gray pollen, thinly clothed with short black hairs; median vitta reddish brown, wider than one parafrontal on upper half; ocellar bristles strong, proclinate and divergent; verticals two pairs, the outer about half as long as the suberect inner ones; frontal bristles descending to level with apex of second antennal segment; parafacials gray pollinose, bare, strongly narrowed below; vibrissae decussate, situated on oral margin; antennae nearly as long as face, wholly black, third segment broad and about five times length of second; arista brownish black, thickened on proximal two-fifths, basal segments short; palpi brown, thickened and usually paler or yellowish apically; proboscis short, with a large fleshy labella; cheek gray pollinose, clothed with fine black hairs, about one-sixth the eye height.

Thorax gray pollinose, with four narrow indistinct black dorsal vittae before the suture and five behind; scutellum black tinged with yellow on apical margin. Chaetotaxy: acrostichal 3,3; dorsocentral 3,4; humeral 4; posthumeral 3; presutural 2; notopleural 2; intraalar 3; supraalar 3; postalar 2; pteropleural 1 (rather weak); sternopleural 2,1; scutellum with three lateral pairs besides a small decussate apical and a discal pair; calypters opaque, white; prosternum haired on sides; propleura bare.

Abdomen black, segments two to four dusted with changeable gray pollen, which viewed from the rear is narrowly interrupted along the median line; basal segment without, the second with a pair of median marginals; third bearing a marginal row of about 10 stout bristles; fourth with a submarginal row and numerous erect bristly hairs above; genital segments blackish, retracted; inner forceps divided but not divergent, posterior edge straight and the tip blunt in profile, clothed with soft brownish hairs along the groove behind; outer forceps reddish at base, distinctly narrower but only a trifle shorter than inner pair; fifth sternite deeply divided, black.

Legs blackish; mid tibia bearing two bristles on outer front side near middle; hind tibia ciliate, with one longer bristle in the row; claws and pulvilli not elongate.

Wings grayish hyaline; costal spine small; fourth vein with an angular stumpless bend; apical cell open at costa well before the wing tip; first vein bare, third bearing two setules at base; hind cross vein oblique to fourth which it joins distinctly nearer bend than small cross vein.

Female: Front at vertex 0.32 of the head width (average of five specimens); outer verticals stouter than in male; third antennal segment about four times longer than second; genitalia terminating in a tapering blunt-tipped organ, not adapted for piercing.

Length, 6.5 mm.

Described from 7 male and 11 female specimens, Ithaca, N. Y., August and September, 1919, reared by Dr. Robert Matheson for whom the species is named. The host record has been misplaced and is not available for inclusion here. Holotype, male, in the Cornell University Collection.

Eleodiphaga martini n. sp.

Male: Front uncommonly wide, at vertex 0.52 of the head width (one specimen), projecting about three-fourths the eye width as viewed from the side; parafacials thinly gray pollinose, blacker and subshining near vertex, beset with reclinate bristles and hairs outside of frontal rows; median stripe dark red, occupying about one-third of frontal width; frontal bristles not very large, descending below insertion of arista; verticals two pairs; ocellars of ordinary size, proclinate and divergent; parafacial fully half as wide as facial depression, thinly gray pollinose, bearing six to ten short hairs on lower extremity; face receding, long and deeply excavated, its ridges nearly parallel, with a row of rather short even bristles extending about to upper third; antennae wholly black; basal segments very short, third reaching to mouth, six or seven times longer than wide; arista velvety black, much shorter than antennae, thickened almost to tip, penultimate segment about twice as long as thick; cheeks gray pollinose, clothed with short black hairs below, nearly one-half the eye height; vibrissae rather short, on level with front edge of mouth; palpi yellow, slightly thickened apically and beset with black hairs; proboscis very short, labella fleshy; eyes bare; back of head thinly gray pollinose and very sparsely pale-haired below.

Thorax black, gray pollinose, marked with four broad but not very well defined black stripes; scutellum black, dusted with somewhat changeable gray pollen. Chaetotaxy: acrostichal 3,3; dorsocentral 3,3; humeral 2; posthumeral 2; notopleural 2; presutural 2 (inner one small); intraalar 3; supraalar 3; pteropleural 1 (not large); sternopleural 2,2 (two lowermost small); scutellum with three lateral and one discal pair all good-sized, besides a much smaller decussate apical pair; postscutellum normal, gray pruinose; infrasquamal hairs absent; calypters opaque, white.

Abdomen rather broadly ovate, wholly black; intermediate segments with changeable gray pollen which fades out beyond the middle of each leaving the hind margins shining black; fourth segment also shining on apex, basal three-fourths with somewhat denser pollen than the preceding ones; first segment without median marginal bristles; second bearing a rather short pair and one at the side above besides weak irregularly spaced discals; third also with irregular discals and a marginal row of about ten; fourth beset with bristles on most of the surface above; genital segments black and retracted.

Legs shining black; middle tibia with two large and two small anterodorsal bristles; hind tibia bearing a row of rather closely spaced uneven bristles on outer posterior edge; claws and pulvilli short.

Wings whitish hyaline; first posterior cell closed, the petiole joining costa well before wing tip and about one-fourth the length of apical cross vein; bend of fourth vein without a stump or fold; last section of fifth vein about two-fifths the length of preceding; third vein bearing three or four setules at base, all others bare; costal spine small; epaulets black.

Length, 7 mm. Female unknown.

Described from one specimen in my collection taken at Parma, Idaho, September 4, 1934, by Chas. H. Martin, for whom the species is named.

The species has the front less protuberant than the genotype E. *caffreyi* Wlt. which is further distinguished in having a wholly shining black abdomen. The only other known species is *E. pollinosa* Wlt. It, like the present form, has the abdomen conspicuously pollinose but differs, aside from its more robust build, in having the apex of the abdomen and the first two antennal segments red. There are other minor differences.

Collatia ornata n. sp.

Propleura and eyes sparsely haired, front decidedly narrowed, hind tibiae not ciliated.

Male: Front 0.17 and 0.16 of the head width in two specimens, sides parallel to middle thence widening rapidly downward; median stripe brown, gradually narrowed upward, about equal the width of one parafrontal on its entire length; sides of front and face gray pollinose, the former sparsely haired outside the frontal rows; ocellars distinct, proclinate; inner verticals smaller than usual, outer pair not developed; frontal bristles rather weak, descending a trifle lower than insertion of arista; antennae slightly shorter than face, black, third segment about two and one-fourth times the length of second; arista black, thickened on proximal third or less and slender beyond, second segment short; face moderately excavated, gray pollinose, its ridges with only a few hairs below; parafacial bare, slightly wider than third antennal segment; vibrissae large, situated a little above the oral margin; cheek blackish, thinly gray pollinose, clothed with black hairs, about one-third the eye height; proboscis short; palpi black, not much thickened apically; back of head clothed with pale hairs intermixed with some black ones on upper part.

Thorax black, gray pollinose; mesonotum marked with four poorly defined black vittae; scutellum black, dusted with gray pollen, which appears denser in a flat rear view. Chaetotaxy: humeral 4; posthumeral 2; notopleural 2; presutural 1; acrostichal 3,3; dorsocentral 2,3; intraalar 3; supraalar 3; postalar 2; pteropleural 1; sternopleural 2,2; scutellum with 3 marginal bristles (hindmost pair large, divergent), besides a discal and an upturned apical pair; postscutellum normal, gray pollinose; calypters whitish or faintly tawny.

Abdomen rather slender, black with a trace of red in the ground color on sides of second segment; intermediate segments densely gray pollinose, the hind margins of each subshining black, this color extending forward on either side the middle above as a defined triangular spot with the apex reaching the basal fourth on second but hardly extending to middle on third; fourth segment gray pollinose as preceding ones with only the extreme apex black; first segment wholly subshining, bearing a pair of long median marginals; second with a discal and median marginal pair; third also with discal pair, besides a marginal row of about ten; fourth bearing an irregular row of discals slightly behind middle and a row of good-sized marginals; hairs on dorsal surface suberect and rather long on last three segments; venter gray pollinose; genitalia black, small and retracted.

Legs wholly black, rather long and slender; middle tibia with one large and usually one smaller bristle near middle on outer front side; hind tibia bearing a row of uneven bristles on outer posterior edge, one near middle distinctly longer and stouter; claws and pulvilli about equal the length of apical tarsal segment.

Wings grayish hyaline; fourth vein with a broadly rounded bend thence almost straight to costa which it joins only a little before extreme tip of wing; first posterior cell open; veins bare except third which has four small hairs at base; hind cross vein oblique and bicurved, reaching the fourth about three-fifths the distance from small cross vein to bend; last section of fifth vein short; costal spine small.

Length, 5 to 6 mm. Female unknown.

Holotype in my collection; received from Dr. Hal Parks, labeled "Colorado, August, 1933," without precise locality or collector's label; in the South Dakota State College collection one (damaged) specimen, Custer, South Dakota, July 16, 1924 (H).

The conspicuous abdominal color pattern readily distinguishes the species from the genotype, *C.* (*Zenillia*) *submissa* A. & W., which differs further in having the small cross vein of wing clouded with brown.

Grisdalemyia setosa n. sp.

Male: Front prominent, about one-fifth the maximum head width in the one specimen; parafrontals and face with shining gray or almost silvery pollen; median stripe dark brown, wider than one parafrontal except on anterior extremity; frontal bristles extending slightly below base of second antennal segment, not very large; inner verticals moderately strong, outer pair not developed; ocellars proclinate and divergent; face receding, its sides and the ridges bare; vibrissae situated on oral marginal well above the lower edge of head; proboscis short, labella fleshy; palpi yellow, rather slender to tips, beset with numerous black hairs; antennae distinctly shorter than face, black beyond the insertion of arista the remainder reddish, third segment about one and one-fourth times length of second; arista shorter than antennae, with middle segment about as thick as long, apical segment bulbous near base thence slender to tip; cheek blackish, thinly gray pollinose, clothed with coarse black hairs, nearly one-half the eye height; eyes sparsely haired; back of head convex, gray pollinose, bearing only black hairs.

Thorax black, gray pollinose; mesonotum showing four poorly defined dark stripes when viewed from behind; scutellum black, lightly dusted with somewhat changeable gray pollen. Chaetotaxy: humeral 3; posthumeral 1; presutural 1 (outer); notopleural 2; acrostichal 2,2; dorsocentral 3,3; intraalar 3; supraalar 3; postalar 2; sternopleural 2,1; pteropleural 1 (small); scutellum with a discal and three lateral pairs (basal one slightly smaller and situated higher up), no apicals between the hindmost pair; prosternum and propleura bare; calypters whitish or faintly tawny, the hind lobes wide and semitransparent.

Abdomen rather flat and broadly oval, with the entire upper surface covered by subshining plumbeous pollen, which is somewhat changeable along the median line when viewed in different angles; first segment with a pair of moderately strong bristles situated well in front of hind margin; the three following segments bearing erect hairs and irregularly arranged bristles which occupy the entire upper surface of the third and fourth except the basal margins but are confined to the median region on the second segment; genitalia black with the outer forceps bright yellow, inner pair rather broad at base and flat behind, tapering outward; venter grayish pollinose, sternites broadly exposed and beset with black bristly hairs.

Legs black; middle tibia with three good-sized bristles on outer front side; hind tibia bearing a row of uneven and rather widely spaced bristles on the outer and inner posterior side; claws and pulvilli elongate, yellowish brown.

Wings rather narrow and extending beyond apex of abdomen, grayish hyaline with a tawny tinge near base; veins yellow, bare, including base of third, fourth vein with an evenly rounded stumpless bend, which is hardly more than the length of small cross vein from hind margin of wing; first posterior cell narrowly closed near extreme wing tip; hind cross vein sinuous, joining fourth a trifle nearer bend than small cross vein; last section of fifth vein very short; costal spine small but distinct.

Female: Front at vertex 0.31 of the head width (one specimen), widening slightly downward; antennae wholly red; the usual two pairs of fronto-orbitals and verticals present; mesonotum more thickly pollinose, abdomen with fewer dorsal bristles, and the wings with a more decided yellow tinge than in the male; claws and pulvilli short; genitalia not adapted for piercing.

Length, 6 mm.

Described from two specimens received from H. C. Severin. Holotype, male, in the South Dakota State College collection, labeled Winner, S. D., July 4, 1924 (H). Allotype, female, Lake Andes, South Dakota, June 30, 1924 (H), in my collection.

The species seems very similar to *G. aldrichi* Curr. characterized from a male specimen from California, which I have not seen. It is described (Can. Ent., LVIII, p. 135) as having the apical scutellars separated by twice the distance intervening between either and the preceding one, hind margins of abdominal segments broadly blackish, and the first with median marginals. In the present species the four apical scutellar bristles are equidistant from each other, the pollen on abdomen extends uniformly to hind margins of last three segments, and the bristles on the first segment are situated considerably before the hind margin.

NOTES ON BASILARCHIA ASTYANAX V. ALBOFASCIATA.

By H. H. Newcomb, South Pasadena, Calif.

This variation or form or aberration (take your choice) was described by me in Psyche, 1907, but I fear the description may have been inadequate as so many collectors persist in designating *albofasciata* as a form of *arthemis*. For instance, Gunder in the Canadian Entomologist, Feb., 1934, writes: "As a matter of fact I am unable to tell his (Newcomb's) types from the average occurring *arthemis*." As Dr. McDonnough has written, "I do not think that Newcomb was very well acquainted with typical *arthemis*. . . . His placing of his white-banded *albofasciata* as a 'variety' of non-banded *astyanax*, instead of a 'variety' of white-banded *arthemis* was an error of course."

C. W. Blackburn writes me as follows: "I agree with Gunder that until breeding-proof is forthcoming *albofasciata* must remain an aberration of *arthemis*." Virgil F. Calkins sent me three specimens of *arthemis* which he had labelled *albofasciata*.

Barnes and Benjamin in their check-list class *astyanax* as a variety of *arthemis*. That is manifestly wrong and it is incomprehensible how two such authorities could make such an error. That these butterflies are distinct species is unquestionable.

The National Geographic, May, 1936, has upon a colored plate a fine example of *albofasciata* which it lists as "Southern White Admiral, *Basilarchia arthemis albofasciata*." The locality is given as Virginia where *arthemis* has never been taken.

I cite all the above to show how general is the misunderstanding about this butterfly. *Albofasciata* is a true variety of *astyanax* and has no consanguinity with *arthemis* either as a form or as a hybrid. Aside from the white band across the wings of *arthemis* there are substantial differences between that butterfly and *astyanax*. The most noticeable difference, perhaps, is the absence of red spots on the upper surfaces of the secondaries of *arthemis*.

Albofasciata is always taken flying with *astyanax* and is never found elsewhere. It does not occur in the north where *astyanax* is absent. In my younger days I collected, season after season, in Milton, Massachusetts, a locality where *arthemis* does not fly but where *astyanax* was abundant. Each year I took specimens of *astyanax* which varied from the merest trace of white on the underside of the primaries to broad bands across all the wings upon the upper surface. There were all sorts of intergrades between these extremes.

Before sending my article to Psyche I submitted it to Dr. Henry Skinner and he gave it his unqualified endorsement which was most satisfactory to me.

In Vol. V, p. 534, Macrolepidoptera of the World, Dr. A. Seitz writes under the caption *L. astyanax*: "By the atavistic occurrence of a white band there may also result great likeness with *L. arthemis*. Such specimens form the ab. *albofasciata*, Newcomb."

I am opposed to cluttering up the Lists with names for slight or rare variations. Take *Melitaea chalcedon* for instance. Thirteen or more forms have been named, some of them hardly noticeable. perhaps the reason for this is the desire of certain authors to pose as authorities and to see their names in print. I named *albofasciata* because it was such a common form and had been subject to much comment among the old-time collectors, many of whom contended it was a hybrid.

CALEPHELIS LOUISIANA (HOLLAND) SYNONYMOUS WITH CALEPHELIS VIRGINENSIS (GRAY).

By W. S. McAlpine, Birmingham, Michigan

In the course of investigation and comparison of the new species *Calephelis muticum* (McAlpine) with other species of the same genus, the writer has examined the type of *Calephelis louisiana* (Holland) including its genitalia, and has come to the conclusion that it is only a badly rubbed specimen of *Calephelis virginensis* (Gray).

Dr. Hugo Kahl of the Carnegie Muesum concurs in this opinion and has informed the writer that some time ago he had planned on calling attention to this error by Dr. Holland.

Calephelis louisiana was described from a single male specimen in collection of Carnegie Museum by W. J. Holland in Entomological News of January 1929, page 20, and later illustrated in the new edition of "The Butterfly Book."

BOOK NOTES.

General Catalogue of the Hemiptera. Fascicle IV. Fulgoroidea, part 2, Cixiidae, by Z. P. Metcalfe; pp. 1–269. (Smith College, Northampton, Mass. $2.00).

This recent part of what will be a vast work when completed begins with a brief introduction giving the family characters, a short historical résumé and an explanation of the form the catalogue follows. The arrangement of families, tribes and genera is stated to be as nearly as possible in phylogenetic order, but the species are arranged alphabetically in each genus. Full synonymies, both generic and specific are given. The fascicle ends with an index of new names proposed and another of genera and higher groups.

It seems unfortunate that the necessity should arise of not setting forth the species in phylogenetic array; but such arrangement is caused by the very fragmentary nature of the work in many groups of the Hemiptera. We are confronted with many regional monographs, or occasional essays on the better known genera. But by far the chief obstacle in this group, as in many another, lies in the numerous isolated descriptions scattered here and there. As an example, consider the Tribe Bothriocerini, in which the catalogue lists but six genera and 40 species. No one appears to have been moved to make an inclusive study of so few genera and species. Accordingly, a cataloguer even in so delimited a number is unable to list the forms in proper serial order. This is unfortunately true of the mass of both the Homoptera and the Heteroptera—far too many bricks and far too little structure!

The magnitude of the whole work, as projected, may be appreciated from the fact that thus far 1100 pages have already appeared with this fascicle, which is only the fourth instalment in the ten years since the inception of the work!

The Origin of Higher Categories in Cynips, by Alfred C. Kinsey. Indiana University Publications. Science Series no. 4, p. 1–334. (Indiana University, Bloomington, Ind. $2.50.)

In this splendid work Dr. Kinsey carries a significant step further his detailed researches into the phylogenetic origin of the main categories in the evolutionary history of the genus Cynips. The reviewer, since he is not an evolutionary taxonomist, cannot adequately discuss Dr. Kinsey's findings. He can, however, appreciate the enormous labor involved in this work, which is an important contribution to the hypothesis of evolution. The summation of Dr. Kinsey's findings is that the ordinary way in which species and higher categories arise in nature is by mutation; and that without isolation, such mutants become merged by inter-breeding into the parent stock, which, however, may be somewhat altered by the infusion of the mutant characteristics. Nevertheless, he concludes that species are realities in nature, even though the higher categories may be deemed but artifices for cataloguing or segregating aggregates of forms. Further, the Darwinian idea of the formation of species through the accumulation of small variations over long periods of time appears not to be borne out by these studies. The mass of evidence adduced in support of his thesis by Dr. Kinsey is most impressive; and the area covered by his studies is a further guarantee of their validity or, at least, of their tenability. His material has consisted of 35,000 specimens of gall insects and 124,000 galls, a massive total of 160,000 specimens. Dr. Kinsey estimates that a complete study would require nearly 160,000 insects and between three and four million galls! The wide territorial range of localities and the numerous species and osculant forms covered in such a study would then form a definitive basis for the delimitation of the species and higher categories. But doubtless in the face of this showing we shall still have with us entomologists who deem they know a species from one specimen, as there have been others who have founded annectant Orders on a single aberrant specimen.

To such workers, and to all who deal in metaphysical philosophies of the origin of species, this work is recommended as a corrective. To those who are devoted to the search for truth as revealed by nature itself, this work will afford a firmer basis for an approach to the origin of species, and bring them to a greater appreciation of the labor involved in any definitive solution of this basic problem.

In order to solve the problems of nature, we must question nature itself at first hand—not in a cloistered study by syllogism, but in the very heart of nature and among its teeming, protean forms.—J. R. T.-B.

EDITORIAL

THE UNATTAINABLE ULTIMATE.

An entomological journal may be one of three things: a section of living humanity, a desiccated mummy, or a stony fossil.

Taking it by-and-large, the most fascinating thing in entomology is the interplay of the human element. Here, we have no abstruse mathematical thinking, cloistered in books and garbed in abstractions the product of cold reason. Here, we deal with life, that unstable equilibrium of matter, changeless but never the same—a weaving pattern of flame.

As is the science, so are its adepts. Each pursues his peculiar quest, as changing as the stream of life. Each follows it in his own way, adding his bit to the mosaic of our knowledge of nature and of life. And each votary is an individual sharply defined and distinct from every other. In entomology, one seeks to know the ways of life of insects; another delves into their thought-processes in an endeavor to understand and interpret their psyche. Still others analyze insect structure and its functions to their minutest detail. Again, some investigate their development from the union of two simple cells to the final complex which is the adult insect.

An entomological journal of the kind first mentioned—one that reflects humanity—shows forth the work of men whose chief concern is with life in its ever-changing aspects. It must then hold up the mirror to life—not alone as an object of study, but likewise as exemplified in its students, with all their human foibles and fortes.

Hence, since we cannot expect unchanging perfection in man, we cannot look for perfection in his product, which but reflects the individual. In our inchoate way, we seek to reflect the human—wise and foolish, sacred and profane, profound and light-minded.

In the language of the day "Be yourself"—not what someone else thinks you ought to be. No one can be anything else anyhow.

To square the circle were easier than for man—even entomologists—to attain to ultimate perfection. What is beyond us is beyond our product, our journals; but these can at least be human.—J. R. T.-B.

PROCEEDINGS OF THE SOCIETY.

Meeting of November 12, 1936.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, November 12, 1936. The program was devoted to the commemoration of the Fiftieth Anniversary of the society's incorporation.

The meeting was called to order at 8.00 p. m. President William T. Davis in the chair, and 17 other members present, *viz.,* Messrs. Bather, Bell, Bower, Cleff, Dietz, Eisenhardt, Engelhardt, Leng, McElvare, Moennich, Proctor, Ragot, Risch, Ruckes, Sheridan, Shoemaker and Siepmann; also, Mrs. Ernest L. Bell, Mrs. M. Cleff, Miss Dietz, Mrs. A. L. Dietrich, Miss Eisenhardt, Mrs. G. B. Engelhardt, Mrs. Max Kisliuk, Mrs. John D. Sherman, Jr., and Messrs. Henry Bird, William P. Comstock, Peter Crowe, Henry Dietrich, James T. Farrelly, Jr., E. Porter Felt, Albert Hartzell, Max Kisliuk, Jr., George J. Rau, John D. Sherman, Jr., Hans L. Stecher and Charles F. Zibbele.

Mr. Davis spoke on the organization and incorporation of the society in 1872 and 1885, respectively, and introduced Mr. Charles Leng, the only surviving incorporator.

Mr. Leng's talk follows:

"In 'Memories of Fifty Years Ago,' printed in the Bulletin, xviii, pp. 1–12, 1923, I wrote what I remembered of the Society organized in 1872, of its early members (most of whom were Germans), and of the prominence in its affairs of Franz G. Schaupp. The departure of Mr. Schaupp, who as corresponding secretary and editor of the Bulletin was its chief executive, precipitated a crisis in the early part of 1884, out of which came the present incorporated Society which, under the control of William T. Davis, George P. Engelhardt, J. R. de la Torre-Bueno, and others, has had a long and successful career. Although in 1884 I was the youngest and far from the most unimportant member, my survival makes me the only living representative of the membership of that period. As far as memory serves, the following is an account of the sequence of events and some of the persons involved.

"In May, 1884, announcements in the Bulletin named John B. Smith as editor, Christopher K. Roberts as secretary, and Wright's Business College continued as the place of meeting. It was also announced that I would contribute a series of illustrated papers on *Cerambycidae,* which with much help from books in the Astor Library, from drawings and advice furnished by Dr. George H. Horn and by Smith, and later from distributional data furnished by Samuel Henshaw, I actually did.

"These announcements, though not expressing all the facts, showed how, at least temporarily, the duties formerly performed by Schaupp had been covered. In October came the announcement that the place of meeting would be the Polytechnic Institute on Livingston Street; its proximity to places of refreshment on Court Street was a consideration though not part of the notice. At the meeting of November 27, a committee to revise the by-laws was appointed; and on December 29 a committee followed which was charged with the duty of incorporating the Society in accordance with the revised by-laws. This duty was speedily performed, thanks in part to Archibald C. Weeks, the "humble notary" as he called himself, who industriously obtained the necessary signatures, ending with Judge Cullen's on January 27, 1885.

"The incorporated Society's birth was announced at the meeting of January 31, 1885, and 32 persons became original members, including at least eight of the earliest members, and three who had joined during 1884. Two of the latter deprived me of the honor of being the youngest member, *viz.*, George Angell, born 1860, and William Beutenmüller, born 1864, but even they, with all the other original members except myself, are deceased, if I am correctly informed.

"In the order of their birth the coleopterists of 1885 were Henry Edwards, at the time stage manager of Wallack's Theatre, born in England about 1830, and following his art in Australia and California before coming to New York. *Omus edwardsi* was named in his honor, as well as many butterflies, for he was also a lepidopterist. He died in 1891. His collection, I believe, is in the American Museum of Natural History.

"August Luetgens was born in Germany about 1837, came to New York as a young man to enter the employ of a German importing firm. He was a bachelor boarding with a German family, in whose home he died in January, 1908. His collection, including European species, was acquired by the late Edward D. Harris (Cicindelidae), Dr. Edward G. Love (Carabus), and myself, and is now distributed in several museums. Mr. Luetgens was possessed of remarkable eyesight, never using spectacles, and equally remarkable tenacity and regularity of habit. One of his fixed rules, I am happy to remember, was to visit my home once every summer.

"Charles Fuchs, born in 1839, one of the early members of the Society, who, however, went to California soon after its incorporation, was the subject of a memoir in the BULLETIN, ix, 73–76, 1914. His friendly help is one of my happiest recollections.

"Martin Linell, born in Norway in 1849, was employed when I knew him in a chemical factory in Brooklyn, and came sometimes to Staten Island on Sundays for collecting. He later joined the staff of the U. S. National Museum and died in Washington in 1897. His ability as a student of taxonomy was great and his early death a misfortune.

"Christopher H. Roberts was born about 1848, lived for some years in Vermont where he made extensive collections of water beetles. For 31 years he served the Society as treasurer. His "Revision of Dineutes," published in 1895, and "Critical Notes on Haliplidae," published in 1913, will long keep his memory alive, though he himself died in 1916. He was a frequent visitor on Staten Island. His collection, including by purchase that of William Jülich, is now partly scattered, but in some important features, in the American Museum of Natural History.

"George W. J. Angell, born in 1860, after some mining experience in Nova Scotia, and commercial work in New York, became an examiner for the Board of Estimate, and earned a high reputation for his ability as an accountant. The work he did was at times mentally exhausting, so that vacations on Cape Cod, and extremely delicate mechanical work in mounting minute specimens afforded relief. A part of his collection, displaying his work in *Pselaphidae* is in my possession, Mr. Angell died March 22, 1929.

"William Buetenmuller, born in 1864, though better known for his work in other orders, was also a coleopterist and as such a frequent visitor on Staten Island. Notwithstanding his crippled condition he made a notable collection in the Black Mountains of North Carolina for the American Museum, of which for many years he was curator of insects. He died February 24, 1934.

"The greatest of the Brooklyn Society's coleopterists (not considering Charles Schaeffer who joined the Society later than the period covered by these notes) was John B. Smith, born in 1858, died in 1912. In his 53 years of life, spent in constant industry, he prepared the astonishing number of 546 entomological papers and books. In Coleoptera these included *Mordellidae, Apion,* and *Lachnosterna,* as well as his famous "Insects of New Jersey." He was moreover continually helping other authors, including myself, and as editor of *Entomologica Americana,* faithful beyond most of its members to the Brooklyn Entomological Society.

"In the years that immediately followed 1884 the Society, under the leadership of Smith, George D. Hulst, Frank H. Chittenden, and others, prospered. Six volumes of *Entomologica Americana* were published and social gatherings at the home of George Franck were held. The hospitality of Mr. Franck, who was born in Frankfort-on-Main in 1839, and died in Florida Oct. 15, 1923, was an element in keeping the old Society active, and perhaps in some measure in its resumption of activity after a period of dormancy.

"Many other members of 1884 should also be remembered; I have spoken only of those with whom I was more or less intimately acquainted."

Mr. Davis read a letter from the New York Microscopical Society, congratulating the Brooklyn Society upon attaining its fiftieth anniversary and wishing it further success, and a telegram of felicitations from Mr. H. P. Loding, of Mobile, Alabama. Dr. Herbert Ruckes, President of the New York Entomological Society, who was present, personally expressed congratulations and best wishes in behalf of the New York Entomological Society.

Mr. William T. Bather, past president of the Brooklyn Entomological Society, spoke informally upon the earlier days of the Society, and added that a significant change had come about since those times in that there was a great increase in the number of insect pests attacking fruits and vegetables.

A brief history of the society and its publications was outlined by Mr. Engelhardt. The BULLETIN was started in 1878, and contained articles by Schaupp and others intended to be of interest to the beginner in entomology and of value to him in naming his material. Eight volumes were published, but interest in entomology was waning, and what might be termed the first period in the history of the Society was at a close. No meetings were held for about ten years, and there were no publications for an even longer period. In 1900 the second period was ushered in, largely owing to the efforts of George Franck in bringing members together. The GLOSSARY was published in 1906, and the BULLETIN was resumed in 1912, and has been published regularly ever since. ENTOMOLOGICA AMERICANA was resumed in 1927 to provide for papers of a monographic nature which were too long to publish in the BULLETIN.

Dr. E. Porter Felt conveyed greetings from the entomologists of Connecticut, whom, he said, did not have any regular entomological society, but managed to have a get-together once a year. He also commented on the increase in the numbers of insect pests in the last couple of decades.

Informal talks were made by Mr. Bell, former secretary of the Society, Mr. Comstock, and Mr. Shoemaker. Mr. Bird said that he was glad to note that many of the members of the Brooklyn Entomological Society were taxonomists who really knew entomology and published papers, rather than the type produced by colleges who investigated morphology and similar fields, and hoped that this would continue to be true.

Mr. Sherman said that the publications of the society were familiar to all entomologists, even abroad, and that Mr. Torre-Bueno deserved much credit for keeping them up to their present high standard.

Mr. Eisenhardt recollected some of the earlier members of the Society, particularly Mr. Jacob Doll; and Mr. Dietz said a few words about Mr. Graef.

Mr. Dietrich spoke of the old Asa Fitch farm at Fitch's Point, near Salem, New York; the old "Farmer's Bughouse" has now been converted into a wood shed, but some of the natives still remember Asa Fitch.

Mr. Hartzell conveyed the best wishes of the Boyce Thompson Institute.

Mr. McElvare spoke of his attendance at some of the earlier meetings of the society while he was still a boy, and how he was impressed by the smoke-filled rooms, and by the talks of some of the members, recalling in particular Groesbeck's talk on bleaching wings for venation. The early members gave him much encouragement and assistance.

Mr. Peter Crowe said that he had found a colony of *Cicindela marginata* at Oakwood Beach, Staten Island, N. Y., and took two males and two females alive, which he placed in an aquarium. Both females laid eggs on July 15th, five days after their capture, which were deposited in the mud at the bottom of the aquarium an eighth of an inch below the surface. The larvae were fed with small ants, which they would sieze when placed near them, but care had to be taken in feeding, lest the larvae be alarmed. Mr. Crowe exhibited eggs and small larvae of the beetle.

Among the other outstanding members of the Brooklyn Entomological Society, there was mentioned the late Mr. Charles Schaeffer, the coleopterist.

The meeting adjourned at 10.05 p. m.

CARL GEO. SIEPMANN,
Secretary.

MEETING OF DECEMBER 10, 1936.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, December 10, 1936, at 8:10 P. M. President William T. Davis presided, and five other members were present, namely, Messrs. Dietz, Engelhardt, McElvare, Siepmann and Dr. Tulloch; also, Messrs. Henry Dietrich, Herman J. Erb, James T. Farrelly, Jr., Richard Fisco, Hans Stecher, Andros Thomson, and Miss Dietz, and a reporter from the *Brooklyn Eagle.*

The minutes of the two previous meetings were read and approved. Mr. Engelhardt reported as Treasurer, and announced the death of Mr. R. P. Dow. An obituary will appear elsewhere in the BULLETIN.

A copy of the new textbook, "Forest Insects" by R. W. Doane, E. C. Van Dyke, W. J. Chamberlain and H. W. Burke was shown by Mr. Davis. The book is of value to students, collectors and forest workers, especially in the western states.

A specimen of the rabbit bot fly, *Cuterebra buccata* obtained at New Springville, Staten Island, was also shown by Mr. Davis. In life this is a formidable insect, slightly resembling a carpenter bee, and it has bright terra-cotta colored markings on the eyes. The insect flies with a straight droning flight and is comparatively easily captured. The larvae live on mice, rabbits, cats and other small animals, and form a large, hard swelling under the skin. One or more larvae are found on a single animal. Mr. Davis said that possibly the bot fly lays its eggs on clover, the eggs being swallowed by the rabbits, which often eat clover. Bot flies attacking cattle and horses, of which the life cycle is known, get into their host by being swallowed. Mr. Engelhardt, on the other hand, suggested that since rabbits are quite persistent in going back to the same place all the time, the flies might lay their eggs in places where the rabbits are likely to come.

Some species of *Sarcophagidae* are also known to attack living animals. Mr. Davis said he had seen a land turtle with a bad sore on its neck caused by the larvae of a species of *Sarcophagidae;* there were a great many larvae in a single sore. These flies may kill a turtle, and land turtles take to water in the summer possibly to avoid flies.

Among other interesting insects, Mr. Davis showed a chrysalis of *Grapta interrogationis,* which he and Dr. Chapin found on the stem of a Jack-in-the-Pulpit, west of Hopewell, N. J., on June 19, 1936. The chrysalis attracted his attention by swinging rapidly from side to side when it was disturbed. Mr. Davis said the chrysalis kept up this gyrating motion for a long time after it was disturbed, and probably was able to scare off some of its smaller enemies in this manner.

Mr. Davis next told of some observations of the larvae of a species of tiger beetle. The larvae of tiger beetles live in burrows in the ground; they lie in wait near the top of the burrow until some unsuspecting insect comes along, which they immediately capture. Mr. Davis said he had always thought these burrows were simply straight perpendicular tubes. However, on August 21, 1936, together with Mr. and Mrs. Howard Cleaves, he examined, near Rossville, Staten Island, the burrows of some tiger beetle larvae. These burrows were about a foot deep, and near the top, at right angles to the perpendicular part, there was an oblong pit, with an opening at the side, slightly above the bottom of the pit, opening into the main shaft. The larva awaits his prey in this pit. This arrangement also prevents the larva from being flooded out by rain. Whether all species of tiger beetles construct their burrows in this manner, Mr. Davis does not know, nor is he sure of the species of tiger beetle larva he had been observing. The presence of adults of *Cicindela generosa* in the vicinity suggests that the larvae might be of the same species.

An exhibit of Cicadas bearing the letter "resh" on the pronotum concluded Mr. Davis's talk for the evening. Many species of Cicadas in the middle west bear the "resh" shaped marking, but it is not so common in the eastern species. Our common *chloromera* sometimes has it, but only about a dozen specimens out of 913 examined showed it. Specimens from Virginia, the District of Columbia, Delaware, Pennsylvania, Louisiana, Alabama, Texas and Staten Island were among those having this marking.

Mr. Engelhardt showed a specimen of the clearwing moth, *Paranthrena polistiformis,* female, collected by Mr. Davis at Old Bridge, N. J., July 30, 1936.

Mr. Hans Stecher told an amusing, though rather sad tale of a Jerusalem cricket he had caught in New Mexico and taken back alive to Staten Island. One day the insect managed to escape somewheres in the Staten Island Museum, and he has never seen the insect since. However, the cricket comes out of hiding every night, to feed upon his rare plants, which he prizes more highly than the cricket. So far his attempts to trap the cricket have been unsucessful.

Mr. Engelhardt showed a pair of the butterfly *Calephelis borealis* from Oakland County, Michigan. In a recent number of the *Canadian Entomologist* appeared a carefully worked-out illustrated life history of this species, based on bred material, by Cyril F. Dos Passos of Mendham, N. J. His specimens were bred from fleabane. The Michigan examples, bred by W. S. McAlpine on a swamp thistle, show differences in the imagoes, as well as in larvae sufficient to warrant recognition as a new species. Mr. McAlpine's final conclusions, after another careful study, appear in the BULLETIN.

Mr. Engelhardt also showed some butterflies and moths received from Alex. K. Wyatt of Chicago, Ill. All were bred and in perfect condition. Included were the moths *Papaipema furcata,* a borer in ash, *Papaipema frigida,* reared from *Thalictum* and the butterflies *Chrysophanus xanthoidea* from *Rumex* and *Euchloe rosa* collected in the sand dunes at Waukegan, Ill. The latter, determined by comparison with the illustrations in Holland's "Butterfly Book," lacks the orange tips so striking in our common eastern species, *Euchloe genutia.* Held against the light, the wings display a faint, rose-tinted suffusion.

A Nominating Committee, to consist of Mr. McElvare, as chairman, and Dr. Tulloch and Mr. Shoemaker, was appointed by Mr. Davis.

The meeting adjourned at 10.00 p. m.

CARL GEO. SIEPMANN,
Secretary.

MEETING OF JANUARY 14, 1937.

The annual meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, January 14, 1937, at 8.15 p. m. President William T. Davis in the chair and ten other members present; namely, Dr. Tulloch and Messrs. Buchholz, Cooper, Dietz, Engelhardt, McElvare, Sheridan, Siepmann, Stecher, and Wilford; also, Messrs. Henry Dietrich, James T. Farrelly, Jr., Richard Fisco, Andros Thomson, C. F. Zimmele, and Mrs. Dietrich.

The minutes of the previous meeting were read and approved. Mr. Engelhardt presented the Annual Report of the Treasurer. A motion that the society express a vote of thanks to Mr. Engelhardt for his excellent work as Treasurer during the past year was made and carried.

The Report of the Publication Committee for 1936 was read by Mr. Engelhardt and ordered placed on file. The new *Glossary* will be out on or before the middle of the year. Ten thousand terms from descriptive entomology, as well as morphology and other aspects of entomology will be defined in the new edition. Galley proof will be submitted to the specialists in the various orders.

Mr. Cooper commented upon the meanings of the terms used by Casey in his work on the Coleoptera. He said that Casey, an engineer by profession, had extraordinary perception of shape and structure. Casey's terms relating to form are precise, often hard to grasp at first, and still more often of difficult access. These terms may be accurately defined, however, by a study of Casey's type material.

Mr. Dietrich said, in a way, every author had a certain vocabulary peculiar to himself. Mr. Cooper replied that most American coleopterists have grown up with the nomenclature employed by Say, Le Conte, Horn, etc., and have adhered fairly closely to their system; but this did not entirely hold true for Casey.

Mr. Davis proposed for membership Mr. Hans L. Stecher, Public Museum, Staten Island, New York. Mr. Stecher being present, it was moved that the By-laws be suspended, and that the Society take up the election of Mr. Stecher to membership, which was accordingly done, and Mr. Stecher was declared a member.

Mr. Engelhardt reported that he attended the meeting of the Entomological Society of America at Atlantic City. About 500 entomologists attended the meeting, and 295 of them were present at the dinner to hear the address by Dr. Patch of the Maine Agricultural Experiment Station.

On his return trip, Mr. Engelhardt visited Mr. Lemmer at Lakehurst. Mr. Lemmer was very successful with his late collecting, and had observed a number of Lepidoptera on the wing around Christmas time. A separate note will be published in the BULLETIN.

Mr. Davis reported the death of Professor Robin Tillyard, who was killed in an automobile accident in Sidney, Australia, in his 55th year.

The death of Professor Cyrus R. Crosby on January 11 at Rochester, New York, was reported by Mr. Dietrich. Mr. Crosby was 58 years old. Well known for his collection of spiders, he was officially extension entomologist. Mr. Davis added that Cornell would find it difficult to find a man so diplomatic and so well met by the farmers as Mr. Crosby was.

Mr. McElvare, reporting as Chairman of the Nominating Committee, recommended that the present officers of the society continue in office. As no further nominations were presented it was moved and seconded that the nominations be closed and that the secretary cast one ballot for the re-election of these officers, which motion was duly carried. A ballot was cast, and the officers were declared re-elected.

Mr. Engelhardt was the speaker for the evening, presenting a paper on "Rambles in Arizona," illustrating his talk with photographs and specimens.

On the way out Mr. Engelhardt stopped at Detroit and Chicago. At the former place he met Messrs. W. S. McAlpine, Sherman Moore, W. W. Newcomb, F. M. Gaige, A. W. Andrews, G. W. Rawson, W. C. Stimson, and William Lawler. These entomologists had a sort of entomological club in Detroit, but the meetings were not formal, nor were there any minutes or publications.

At Chicago, Mr. Engelhardt made a short excursion to the sand dunes at Waukegan, Illinois, favorite collecting-place around Chicago. There are large sand dunes in this region, much as there are at the seashore; on the tops of the dunes there are a few wind-blown trees and sparse vegetation, but in the depressions the vegetation is profuse. This is really the beginning of the prairie vegetation. In the roots of a species of Blazing Star, *Lacinaria pynostachia,* he found the larva of a clearwing moth, which was bred out by Mr. Wyatt in late July, and found to be *Synanthedon morula.*

The highlight of the Arizona trip was the visit on June 11 and 12 to Oak Creek Canyon, near Flagstaff, Arizona, in company with Mr. Grossbeck of the Forest Service Bureau. Professor Snow and other pioneer collectors had been to this canyon around 1900; but outside of Dr. E. C. Van Dyke's trip in 1935, there were no recent collectors there. Mr. Engelhardt obtained two species of clearwing moths here. A series of *Synanthedon edwardsii,* a borer in Pentstemon, was obtained. This species was previously only known by a single male specimen in the New York Museum. This species can now be united with *Synanthedon utahensis,* described by Beutenmüller, and hitherto known only by two females. *Synanthedon mariona* was found boring in Fiddle Neck; a series of the males of this species, previously unknown, were obtained.

In *Rudbeckia ampla* a borer in the pupal stage was found, which was hoped to be a third species of clearwing. It turned out to be a Tortricid, evidently a new species. A larger larva in the roots of the same plant, believed to be a *Papaipema* larva, was sent to Mr. Henry Bird, who is breeding it out.

Other points of interest in Arizona included Sunset Crater Ice Cave, the bottom of which is covered with ice, although the temperature outside is around 90 degrees, and the Boyce Thompson Arboretum.

A trip was made with Mr. Parker to the White Mountains near Globe, Arizona; the latter obtained a few specimens of *Cychrus parkeri.*

The meeting adjourned at 10.30 p. m.

CARL GEO. SIEPMANN,
Secretary.

SMITH'S GLOSSARY.

At length the new Smith's *Glossary* has arrived at a point at which it is possible to make a definite announcement. All the manuscript is now with our printer; and unless we meet with more than the regular interruptions, we hope to have this work out on or before September 1st of this year.

What was planned to be a revision of a standard work, as time went on, turned out to be a complete rewriting. The original Explanation of Terms Used in Entomology contained some 4300 terms. Our new revision will contain nearly 12,000 definitions; and since in many cases, numerous terms with slightly different spellings have the same definition, there will be listed nearly 10,000 terms. These definitions and terms have been revised and added to from the literature of entomology, and most frequently are defined as employed by individual authors, often in their own words.

The modern usage of terms, as well as their original acceptation is indicated. Plurals are shown, at least in the root term, or as indicated by the originator of a term, even though such plural is evidently incorrect. A selection of terms in biological chemistry, ecology and medical entomology is included. There will be at least two appendices, one of abbreviations and the other of arbitrary signs as used in entomology. Plates of structures as now construed will number eight, most of them newly drawn for *The Glossary*.

This volume will run to at least 400 pages, in legible 10-point type. It will be bound in water-, dirt- and insect-proof cloth. And last, but not least, the price will be $5.00 per copy.

THE PUBLICATION COMMITTEE OF THE
BROOKLYN ENTOMOLOOGICAL SOCIETY.

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BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXXII June, 1937 No. 3

NOTES ON HIPPOBOSCIDAE.

5. The American species of Lipoptena.

By J. Bequaert, Department of Tropical Medicine, Harvard Medical School, Boston, Mass.

In the course of a revision of the subfamily Melophaginae, now in progress, several hundred specimens of *Lipoptena,* from North and South America, have been studied. The material was obtained from many different sources, which for want of space cannot be acknowledged by name. I am, however, under particular obligation to Professor G. F. Ferris, who very generously forwarded to me for study his entire collection of Melophaginae.

In the American material seen thus far, I am able to distinguish, on structural characters, no more than four species, two of which appear to be very closely related. The following key may help in separating them.

1. Integument of head and dorsum of thorax granular, owing to thickened bases of the numerous setae. Frontal bristles and hairs many (12 to 15 or more on each side), extending to behind the eyes. Apex of scutellum usually with 4 (rarely with 3, 5 or 6) setae of about equal length. A row of short, very stout, notopleural setae before the base of the wing. Apical seta of fore tibia strong. Fore coxa with a dorsal, retrograde spur. Claws distinctly asymmetrical. Abdomen (in both sexes) basally with a single sclerotized tergite, divided into two plates by a narrow median notch. Basal sternite evenly rounded posteriorly. Costa of wing ending far from the tip in a broad, stigma-like thickening .... *L. ferrisi* J. Bequaert.

Head and thorax with few, spaced setae. Usually one to three (rarely more) frontal bristles and hairs, none of them behind the eyes. Fore coxa without dorsal, retrograde

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spur (at most slightly angular behind). Sclerotized plates of abdomen different .... 2.

2. Scutellum with an apical row of 6 to 8 setae, of which the median pair are much the longest. Mesonotum with a fine median impressed line, on either side of which there is a conspicuous curved row of setae followed by a slightly curved longitudinal depression. Two rows of notopleural setae before the base of the wing, the posterior ones very long. Apical seta of fore tibia stout. Claws unusually slender, slightly asymmetrical. Abdomen with many sclerotized plates dorsally: a short basal plate, divided by a broad median notch; two long, lateral plates on each side leaving a broad median space partly covered by four plates, the first of which is reniform, the others transverse. Basal sternite deeply bifid. Costa of wing ending rather close to the tip, without conspicuous thickening .... *L. cervi* (Linnaeus).

Scutellum with a single apical pair of setae (very rarely more; sometimes only one seta). Median setae of mesonotum not placed in two conspicuous longitudinal, curved rows. Claws robust. Sclerotized plates of abdomen different. 3.

3. Mesonotum with many setae, those of the median portion forming a transverse group (in more than one row) on either side of the median impressed line. Two rows of notopleural setae before the base of the wing, the posterior ones very long. Abdomen dorsally (in female) with a short basal plate divided by a narrow median notch; one very long, triangular, lateral plate on each side; and two small, transverse, median plates before the anus; middle of the dorsal face without differentiated plates. Basal sternite deeply bilobed. Apical seta of fore tibia very weak, hair-like. Claws distinctly asymmetrical. Costa of wing ending far from the tip in a broad, stigma-like thickening .... *L. depressa* (Say).

Mesonotum with few setae, those of the median portion forming a single transverse row of three or four, in line with the single row of notopleural setae before the base of the wing. Sclerotized plates of abdomen much as in *L. depressa*. Apical seta of fore tibia stout. Claws nearly symmetrical. (Wing unknown) . . *L. mazamae* Rondani.

Lipoptena ferrisi J. Bequaert.

Lipoptena ferrisi J. Bequaert, 1935, Bull. Brooklyn Ent. Soc., XXX, p. 170 (new name for *L. subulata* Ferris and Cole, 1922).

Lipoptena subulata Ferris and Cole, 1922, Parasitology, XIV, p. 187, figs. 2*C* and 4 (♂ ♀; off *Odocoileus columbianus*, in Humboldt and Mendocino Counties; also taken in flight on Mt. Wilson; all in California). Not of Coquillett, 1907.

As I stated in a preliminary notice, the common Deer parasite of the Pacific Coast and western Rocky Mountains was erroneously believed by Ferris and Cole to be *L. subulata*. A study of Coquillett's types and of additional material from the eastern United States, shows that *subulata* is a different insect, discussed below under *L. cervi*.

It is not necessary to redescribe *ferrisi* at this time, since it was sufficiently characterized and well illustrated by Ferris and Cole. My key, moreover, shows the characters of diagnostic value. *L. ferrisi* is not closely related to the other American species.

Specimens Examined:—Holotype (female) and allotype (male), off *Odocoileus columbianus*, Mendocino Co., California (G. F. Ferris Collection).

Numerous paratypes of both sexes, winged and deälated, from the following localities. British Columbia: Victoria (Can. Natl. Coll.); Savary Island (Can. Natl. Coll.); Kamloops, off *Odocoileus hemionus hemionus* (G. J. Spencer and J. Keyes).—California: Mt. Lowe, Los Angeles Co. (J. M. Aldrich); Toro Peak, Sta. Rosa Mts., 8,000 ft., Riverside Co., off Mule Deer, *Odocoileus hemionus californicus* (F. Grinnell, Jr.); San Gabriel Mts., Switzers Camp, Los Angeles Co. (F. Grinnell, Jr.); Humboldt Co., off *Odocoileus columbianus* (in G. F. Ferris Coll.); Tulare Co. (in G. F. Ferris Coll.); Madera Co., off Western White-tailed Deer (Henry Dietrich); San Jacinto Mts., Riverside Co. (R. H. Beamer); Strawberry, Tuolumne Co. (R. H. Beamer); Lemon Cove, Tulare Co. (Paul W. Oman); Tehama Co., supposedly off California Valley Quail, *Lophortyx californica* (L. V. Compton); Beckwith, Plumas Co., off Mule Deer (L. W. Swift); Westwood, Lassen Co., off Western Black-tailed Deer; Mt. Pinos, Sta. Barbara Co. (C. S. Robinson); Sulphur Springs, Lake Co. (L. S. Neville); Minnelusa, San Bernardino Co. (H. O. Robe); San Bernardino, San Bernardino Co. (D. S. Spears); Fresno Co., off Western Black-tailed Deer (M. F. Canova); Logan Creek, Riverside Co., or San Bernardino Co. (M. F. Canova); Carson Creek, Marin Co. (J. W. Maillard); Yosemite Valley, Mariposa Co.

(E. C. Van Dyke).—OREGON: Cascadia, Linn Co. (W. W. Baker); Adel, Lake Co., off Mule Deer (Alex. Walker); Riddle, Douglas Co., off Deer (C. M. Gjullin); Tiller, Douglas Co. (L. S. Stevens); Enterprise, Wallawa Co., off Mule Deer (H. H. Stage); Dayville, Grant Co. (H. Carr); Big Valley, Lake Co., off Mule Deer (H. H. Stage); Keno, Klamath Co., off *Odocoileus columbianus* (H. H. Stage); Malheur National Forest, Harney Co., off Mule Deer (H. H. Stage).—MONTANA: Ravalli Co., off Black-tailed Deer (sent by C. B. Philip); Lincoln Co. (sent by C. B. Philip); Sanders Co., bred from pupae off Western White-tailed Deer (W. L. Jellison).—Paratypes in the C. F. Ferris Collection, the Canadian National Collection (Ottawa), Kansas University (Dept. Ent.), the Rocky Mountain Spotted Fever Laboratory (Hamilton, Mont.), the United States Bureau of Entomology, Cornell University (Dept. Ent.), the United States National Museum, the American Museum of Natural History, the Museum of Comparative Zoölogy (Cambridge, Mass.), the California Academy of Sciences, the University of British Columbia and the Wm. W. Baker Collection.

L. ferrisi is probably distributed over the entire Pacific Coast and western Rocky Mountain area, where it appears to be a common parasite of the Western Black-tailed Deer, *Odocoileus columbianus* (Richardson), the Mule Deer, *Odocoileus hemionus* (Rafinesque), and the Western White-tailed Deer, *Odocoileus virginianus leucurus* (Douglas). Mr. H. S. Peters, of the U. S. Bureau of Biological Survey, sent me one winged male supposedly taken (but not by him) from California Valley Quail, *Lophortyx californica* (Shaw); but, as I explain under *L. cervi* and *L. depressa*, it may be doubted whether the fly was more than an accidental guest in the plumage of the bird and whether it was actually feeding on the blood of this host.

Lipoptena cervi (Linnaeus).

Pediculus cervi Linnaeus, 1758, Syst. Nat., 10th Ed., I, p. 611 (no sex; no locality; from Europe; "in *Cervo elapho, dama, capreolo*"); 1761, Fauna Suecica, 2d Ed., p. 476 here recorded from Sweden, which may be taken as the type locality).

Hippobosca (*Lipoptena*) *cervina* Nitzsch, 1818, Germar's Mag. d. Entom., III, p. 311 (emendation of *cervi* Linnaeus).

Pediculus capreoli "Frisch" Nitzsch, 1818, Germar's Mag. d. Entom., III, p. 311 (as a synonym of *H. cervina*).

[Frisch, 1736, Beschr. All. Insekt. in Teutschland, XII, p. 15, Pl. V; pre-Linnaean.]

Haemobora pallipes Curtis, 1824, British Entomology, VIII, Pl. XIV (♂; off man; New Forest, England).

Ornithobia pallida Meigen, 1830, Syst. Beschr. Europ. Zweifl. Ins., VI, p. 230, Pl. LXIII, figs. 21–24 (no sex; no host; Europe).

Ornithomyia nigrirostris v. Roser, 1840, Correspondenzbl. Landwirtsch. Ver. Würtemberg, I, p. 64 [original of this reference not seen].

Lipoptena alcis Schnabl, 1881, Phys. Denkschr. Warschau, p. 34 (♀; off Elk, *Alces alces*; region of Pinsk, Lithuania) [original of this reference not seen].

Lipoptena subulata Coquillett, 1907, Ent. News, XVIII, p. 290 (♀ ♂; off Deer; Woodstock, New Hampshire).

Lipoptena cervi var. *obscura* "Rörig" Lühe, 1906, Schrift. Phys. Oekon. Ges. Königsberg, XLVI (1905), p. 180 (as a synonym of *L. cervi* var. *alcis*).

SPECIMENS EXAMINED.—ENGLAND: Nottingham, Wollaton Park, off Red Deer (H. P. Jones); Great Park, Windsor, Berks. (G. Salt).—SCOTLAND: Perthshire, 2,000 ft., off Red Deer (R. Meinertzhagen); Balmacaan, Glen Urquhart, Inverness, off Red Deer (received from E. E. Austen).—DENMARK: Horseus, Jutland; Lindum, Jutland; Ruderhegn and Dyrehaven near Copenhagen.—ESTHONIA: Reval, off *Alces alces*.—BELGIUM: Mirwart (J. Ghesquière).—FRANCE: Parcé, Dept. Sarthe (G. Abot); Recey-sur-Ource, Dept. Côte d'Or, off *Capreolus capreolus* (J. P. Chapin); Fougère, Dept. Maine-et-Loire, off Roe.—GERMANY: Rossitten, Kurischer Nehrung, off *Alces alces*; East Prussia, off *Alces alces* (received from A. Bau, in G. F. Ferris Collection); Hunsrück, Rheinland, off *Capreolus capreolus* (C. Hilgert).—AUSTRIA: Villach, Carniolia (Dr. Troll); Kaltenlust Geb., Lower Austria (Ruschka); Aggsbach, Lower Austria (H. Zerny); Hainfeld, Lower Austria (J. Mik); Mödling (A. Handlirsch); Stein am Danau; Manhartsberg, Lower Austria (H. Zerny); Nasswald, Lower Austria (H. Zerny); Forchtenau, Burgenland (H. Zerny).—HUNGARY: (H. Zerny).—ALBANIA: Ungrej (H. H. Karny).—SIBERIA: Baikal University Station (T. D. A. Cockerell); Amur Region (Schrenk).—NEW HAMPSHIRE: Woodstock, Grafton Co., off Deer (J. T. Long; holotype and paratypes of *L. subulata* at U. S. Nat. Mus.); Corbin Park, near Newport, Sullivan Co., off *Odocoileus virginianus borealis* (J. D. Smith; T. Barbour and W.

S. Brooks).—MASSACHUSETTS: Naushon Island, Dukes Co., winged and deälated specimens, off Northern White-tailed Deer, *Odocoileus virginianus borealis,* and winged specimens flying, October 25, 1924 (J. Bequaert).—PENNSYLVANIA: Pike Co., off Virginia White-tailed Deer (H. S. Peters); Clinton Co., off Virginia White-tailed Deer (T. E. Winecoff).

The Deer ked, *Lipoptena cervi,* is found over most of the Palearctic Region. There are definite and reliable published records from England, Scotland, the Netherlands, Belgium, France, southern Scandinavia, Denmark, Germany, Esthonia, Curland (Latvia), Lithuania, Poland, Austria, Carniolia, Hungary, Dalmatia, Tcheko-Slovakia, Bulgaria, Albania, Spain, Algeria, and Siberia.

Walker's (1849) records from Northern Bengal and Egypt, and C. Dover's (1921) from Barkuda Island (Chilka Lake, India; off Chital) were probably erroneous. The specimens recorded by C. W. Howard (1912) from Portuguese East Africa, as *L. cervi,* were a species of *Echestypus* (I have seen them at the U. S. National Museum). I am also inclined to doubt the authenticity of Austen's (1903 and 1906) record of *L. cervi* from Modderfontein Factory (14 miles south of Johannesburg, Transvaal); at any rate, the species has not been taken in South Africa in recent years.

The normal hosts of *L. cervi* are the several common Deer of the Palearctic Region, *viz.,* the Roe, *Capreolus capreolus* (Linnaeus) (=*caprea* Linnaeus); the Red Deer, *Cervus elaphus* Linnaeus; and the Fallow Deer, *Dama dama* (Linnaeus); as well as the European Elk, *Alces alces* (Linnaeus).[1] On these normal hosts the parasites are often numerous, sometimes three or four dozen being found on a single Deer. *L. cervi* has been taken accidentally on various other mammals. Massonat (1909) reports a deälated female off a Badger, *Meles taxus,* at Les Dombes (Dept. Ain, France); Brumpt (1922) and L. Falcoz (1926) list among the hosts in nature the European Boar, *Sus scrofa*; and Kohn (1924) reports finding a deälated male on a cow. That the winged stages also stray onto horses (Mégnin, 1899) and people is well known. G. Schroeder (1911) tells how he caught on an October day, in Pomerania, over a hundred flies that settled on people who were crossing a clearing in a forest frequented by Deer. H. Scholtz (1848), Villeneuve (1913), and Brumpt (1922) observed this species biting man either in nature or in captivity. Brumpt also fed the flies in captivity on monkey, dog, mule, horse, chicken and pigeon.

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[1] Various authors include the North European reindeer, *Rangifer tarandus* (Linnaeus), among the hosts of *L. cervi*; but I have been unable to trace an authenticated instance of the fly having been taken from this host.

In the few localities of the northeastern United States where *L. cervi* has become naturalized, it is often abundant on Virginia White-tailed Deer, *Odocoileus virginianus borealis* Miller.

There is a widespread belief, often repeated in general accounts and text-books, that the winged individuals of *L. cervi* live on birds (especially gallinaceous birds) in the spring and migrate to Deer in the fall, after which they lose the wings. I can find, however, no evidence that *L. cervi* is normally winged on birds and wingless on mammalian hosts. The error probably originated with Meigen's description of the winged individuals as a distinct species, although he stated clearly enough that the host of his *Ornithobia pallida* was unknown, adding "vermuthlich ist er auf Vögeln." Newly hatched, winged flies may, of course, sometimes stray onto birds. Yet I have found no strictly reliable records of bird hosts. Leunis (1886) and Klugkist (1909) mention the Grouse (Haselhuhn; *Bonasa*) as one of the hosts; and Schuurmans-Stekhoven (1928) lists *L. cervi* from "Finken: *Passer domesticus, Fringilla* sp." But it is not clearly stated that these authors themselves took any of the flies off the birds. Where Deer are common, winged *Lipoptena* are frequently abundant in the fall, often flying onto man, and when this happens with a hunter, while he picks up a freshly shot bird, it might readily lead to the belief that the flies came off the bird. There are, moreover, definite observations of winged, as well as wingless, individuals occurring in large numbers on Deer in the autumn.

That *Haemobora pallipes* Curtis and *Ornithobia pallida* Meigen were based upon winged males of *L. cervi* is now generally accepted (see C. v. Siebold, 1845 and 1850; H. Schaum, 1849; H. Loew, 1849, quoted by Schaum; J. Schiner, 1853; etc.) and needs no further discussion. The synonymy of *Ornithomyia nigrirostris* v. Roser was established by Speiser (1905) through a study of the types, which are males of *L. cervi* (not *Ornithomyia avicularia,* as Bezzi had surmised).

After carefully comparing several females and males of so-called *L. alcis* from European Elk, with *L. cervi* off European Deer from England and France, where Elk is not known to occur, I am unable to discover any difference whatsoever either in structure or in the arrangement of the setae. Schnabl claimed that the form found on Elk was larger and darker than the usual parasite of Deer; but I have seen specimens taken on Deer that do not appreciably differ in these respects from those off Elk. C. T. v. Siebold (1850) and

J. Mik (1882) reached similar conclusions. I do not believe that *alcis* can be retained even as a variety. In my opinion the Elk is merely one of several normal hosts of *L. cervi*, and where both Deer and Elk occur the fly moves freely from one to the other. *L. cervi* var. *obscura* is a superfluous synonym of *alcis*.

When Coquillett described his *L. subulata*, he compared it with *L. depressa*, but not with the European *L. cervi*. His description is based mainly upon color, the only structural character of importance mentioned being the stout seta at the apex of the fore tibia. Ferris and Cole (1922) believed that Coquillett's species was the common Western parasite of Deer which I have called *L. ferrisi*. A careful study of Coquillett's types, as well as of numerous specimens from other localities in the eastern United States, shows conclusively that *L. subulata* is not separable from *L. cervi*. It is, moreover, my belief that the occurrence of this species in North America is merely due to recent and accidental introduction by man. In the limited area where it has been taken, Deer have often been introduced from Europe during the nineteenth century. From these introduced animals the keds passed onto the native Virginia White-tailed Deer, on which host they are now perfectly acclimatized in certain localities.

Lipoptena depressa (Say).

Melophagus depressus Say, 1823, Jl. Acad. Nat. Sci. Philadelphia, III, p. 104 (no sex; off "*Cervus virginianus*"; North America, without definite locality, but probably from somewhere in Colorado).

Lipoptena depressa Ferris and Cole, 1922, Parasitology, XIV, p. 182, figs. 1, 2B, 2D, and 2F (♀ ♂).

Specimens Examined.—British Columbia: Cranbrook, off Columbia White-tailed Deer; Vancouver Island (Victoria; Comox; Englishman's River; and north end), off Columbia White-tailed Deer (G. J. Spencer); Howe Sound, on the mainland, off Columbia White-tailed Deer (G. J. Spencer); Lasqueti Island, off Columbia White-tailed Deer (G. J. Spencer); Deer Park (G. F. Ferris); Little Canbon (K. Racey).—Washington State: Orcas Island, San Juan Co., off Western Black-tailed Deer (C. B. Philip); Carson, Skamania Co., off *Odocoileus columbianus* (H. H. Stage).—Oregon: Malheur National Forest, Harney Co., off Mule Deer (H. H. Stage); Dayville, Grant Co. (H. Carr); Kimberly, Grant Co., off Mule Deer (C. V. Bales); Cascadia, Linn Co. (W. W. Baker); Riddle, Douglas Co., off Deer (C. M.

Gjullin); Alsea, Benton Co., off Western Black-tailed Deer (H. H. Stage); Florence, Lane Co., off Western Black-tailed Deer (H. H. Stage); Blaine, off Western Black-tailed Deer (H. H. Stage); Paisley, Lake Co., off Mule Deer (H. H. Stage); Lincoln Co., off *Odocoileus hemionus* (H. H. Stage); Harney Co., off *Odocoileus hemionus* (H. H. Stage).—MONTANA: Trout Creek Sanders Co. (Ed. Button); Lo-Lo, Missoula Co., off Western Black-tailed Deer (W. V. King); Ravalli Co. and West Fork, Ravalli Co., off Western Black-tailed Deer (C. B. Philip).—CALIFORNIA: Los Angeles Co. (M. F. Canova); Logan Creek, Riverside Co. or San Bernardino Co. (M. F. Canova); 18 miles East of Mokelumne Hill, Calaveras Co. (M. F. Canova); Coachella, Riverside Co., off Western Black-tailed Deer (R. W. Burgess); Denny, Trinity Co., off Deer (E. E. Ladd); Carson Creek, Marin Co. (J. W. Maillard); Asilomar, Monterey Co. (L. S. Slevin); Sequoia National Park, 2,000 to 5,000 feet (E. C. Van Dyke); Mendocino Co. (E. R. Leach); Piedmont, Alameda Co. (E. R. Leach); 10 miles Northeast of Mariposa, Mariposa Co. (E. H. Nast); Cypress Ridge, Marin Co. (E. P. Van Duzee); Green River Camp, Lower Santa Ana Cn., Orange Co. (E. P. Van Duzee); Carmel, Monterey Co. (L. S. Slevin); Havilah, Kern Co. (E. S. Van Dyke); San Jacinto Mts., Riverside Co. (R. H. Beamer); Mt. Pinos, Sta. Barbara Co. (C. S. Robinson); Sulphur Springs, Lake Co. (L. S. Neville); Big Bear Lake, San Bernardino National Forest, Minnelusa, San Bernardino Co. (H. O. Robe); Craig Lake, 50 miles northwest of Los Angeles, Los Angeles Co. (L. S. Neville); San Bernardino, San Bernardino Co. (D. C. Spears); Mt. Hamilton, San Jose, Santa Clara Co., off Deer (L. R. Cody); Westwood, Lassen Co., off Western Black-tailed Deer; Tehama Co., supposedly off California Valley Quail (L. V. Compton); Ventura Park, Ventura Co. (W. L. Jellison); Monrovia Canyon, Los Angeles Co. (Chas. M. and Dorothy Martin); Bair's Ranch, Redwood Creek, Humboldt Co., off Western Black-tailed Deer (H. S. Barber); Humboldt Co., off *Odocoileus columbianus* (G. F. Ferris); San Gabriel Mts. near Pasadena, Los Angeles Co. (F. Grinnell, Jr.); Gualala, Mendocino Co., off *Odocoileus columbianus* (G. F. Ferris).—SOUTH DAKOTA: Custer State Park, Hermosa, Custer Co., 50 specimens off Wapiti, *Cervus canadensis* (R. E. Milliken).

All reliable records of *L. depressa* are from western North America: British Columbia, the State of Washington, Oregon, California, Montana and South Dakota. It will undoubtedly be found also in Idaho, Wyoming, Nevada, Utah, Colorado, Arizona and New Mexico. Statements as to its occurrence in the eastern United States, I regard as erroneous. Say originally gave no locality for his specimens, but there is every reason to believe that he obtained them somewhere in the Rocky Mountains of Colorado, while a member of Stephen H. Long's Expedition of 1819–1820 (see the introductory remarks by Say, 1823, Jl. Acad. Nat. Sci. Phila., III, p. 9). Wiedemann (1830), redescribing a cotype received from Say, merely assumed that it came from Pennsylvania, and this locality was copied by C. H. T. Townsend (1897), Speiser (1904), and Aldrich (1905). Falcoz (1930) reports *L. depressa* from Mexico, without more definite locality, and its occurrence in northwestern Mexico is quite likely.

The normal hosts are the Western Black-tailed Deer, *Odocoileus columbianus* (Richardson), the Western White-tailed Deer, *Odocoileus virginianus leucurus* (Douglas), the Mule Deer, *Odocoileus hemionus* (Rafinesque), and the Wapiti or American Elk, *Cervus canadensis* (Erxleben). Mr. H. S. Peters sent me seven winged males supposedly taken (but not by him) off California Valley Quail, *Lophortyx californica* (Shaw). While it is not impossible that these flies might have been living temporarily in the plumage of the birds, the record needs confirmation, for the reason given in my discussion of birds as temporary hosts of *L. cervi.*

Lipoptena mazamae Rondani

For synonymy, references and list of specimens examined, see J. Bequaert, 1931, Psyche, XXXVIII, p. 191.

ADDITIONAL SPECIMENS EXAMINED.—PANAMÁ: Ancón, Canal Zone (F. C. Bishopp and Green); Camp Pital, Chiriquí, off Brocket, *Mazama sartorii reperticia* Goldman (L. H. Dunn); Miraflores (A. H. Jennings); Chagres River Valley, off Panamá White-tailed Deer, *Odocoileus rotschildi* (Thomas) (L. H. Dunn); Alajuila, Canal Zone (H. C. Clark).—MEXICO: Camp Stella, Nayarit (recd. from R. Matheson); Orizaba (Sallé).—VENEZUELA: La Rubiera, one male and one female (F. M. Root; G. F. Ferris Collection).—TRINIDAD: Caparo (S. M. Klages); Guaico, off *Mazama rufa* (F. W. Urich.)—SURINAM (Dutch Guiana): Paramaribo, two female cotypes of *surinamensis* (C. Heller; sent by A. Bau to G. F. Ferris); Moenyo, one male (C. Bonne).—BRAZIL: Hansa, Sa. Catharina, off *Mazama rufa* (Ehrhardt).—PARAGUAY: without more definite locality.—ECUADOR: San José, west of Huigra, 1,750 ft., in western Ecuador, off *Tayra barbara.*—BOLIVIA: Yacuiba, off *Mazama* (G. F. Ferris Collection).—TEXAS: Victoria, Victoria Co. (O. S. McMillin); Kerrville, Kerr Co. (H.

Lacy); San Antonio, Bexar Co. (Alex. Schleyer).—FLORIDA: 20 miles East of Naples, Collier Co., off White-tailed Deer (O. C. Van Hyning).—SOUTH CAROLINA: Charleston, off White-tailed Deer (H. S. Peters); Mount Holly, Orangeburg Co., off White-tailed Deer (D. Brainerd); Georgetown Co., off White-tailed Deer.—GEORGIA: Wassaw Id. near Savannah, Chatham Co., one specimen off cattle (U.S.N.M.).

L. mazamae is the only species of the genus known from Central and South America. There are reliable records from Mexico (as far north as Vera Cruz), Yucatán, Guatemala, Panamá, Venezuela, British Guiana, Dutch Guiana, Trinidad, Bolivia, Ecuador, Paraguay, Brazil, and northern Argentina (Chaco de Santiago del Estero). It is of considerable interest that this tropical species extends into the southeastern United States (Texas, Florida, Georgia and South Carolina). It probably occurs also in Louisiana, Mississippi and Alabama.

In an earlier paper (1931) I was unable to settle the question as to the normal hosts of this species. Material recently sent by Dr. L. H. Dunn, from Panamá, makes it quite certain that *L. mazamae* is a parasite of both true Deer (various species or races of *Odocoileus*) and Brocket (various species or races of *Mazama*). In the southeastern United States it occurs on White-tailed Deer, *Odocoileus virginianus virginianus* (Linnaeus). The accidental hosts include thus far domestic cattle and the grison (*Tayra barbara* Linnaeus).

I have attempted to show in 1931 that, from published descriptions, *L. depressa* var. *mexicana* C. H. T. Townsend (1897), *L. conifera* Speiser (1905), and *L. surinamensis* Bau (1930) could only be synonyms of *L. mazamae*. A recent study of two cotypes of *L. surinamensis* (the type locality of which is, according to the labels, "Paramaribo," not "Macaraibo") fails to disclose any difference from the widespread *L. mazamae*.

A NEW SPECIES OF CHALCIDOIDEA (HYMENOPTERA—CALLIMOMIDAE).

By John C. Schread, New Haven, Conn.

Lochites smithi n. sp.—Female: Length 2 mm.; ovipositor, 2.25 mm. Thorax bluish green with a slight brassy reflection in some lights. Head transverse about 1/7 wider than widest part of the thorax, viewed from the front less than 5/6 as long as wide; vertex and face concolorous with the thorax, excepting that the face has a heavier brassy reflection; lower part of head strongly cupreous-red in certain lights, clothed rather sparsely with short silvery pile; pile shorter and denser above the insertion of the antennae and on the vertex; reticulately punctate sculpture, punctures minute, more numerous and perceptible below the antennal articulation; vertex more coarsely reticulately punctate than the face; eyes large, ocelli and eyes reddish; postocellar line about 2¼ times the length of the lateral ocellar line; postocellar one-half its short diameter from the margin of the eye; lateral ocellar line equal to the short diameter of postocellar; antennocular line 1½ times as long as interantennal line; ocelloccipital line not quite twice ocellocular line; scape yellow; apical one-third above brownish; remainder of antennae brown; pedicel as long as the second funicle joint, dark brown, with a faint cupreous reflection, apex lighter brown; ring-joints small, much wider than long but narrower than the funicle; first funicle joint longest, somewhat longer than the succeeding joints which grow successively shorter but wider toward the club, last funicle joint wider than long; club about as long as the three preceding joints, but wider, tapering to a point; flagellar joints clothed with two longitudinal rows of keel-like hairs; carina separating antennae fairly well developed, broad and extending one-third the distance to the mouth border.

Thoracic dorsum moderately clothed with short appressed silvery pile, dorsum transversely reticulately rugose; the reticulation on the anterior portion of the prothorax more clearly defined, elongate and narrower than on the posterior violaceous spot on median posterior one-third; reticulation on the anterior two-thirds of mesoscutum the same as that on the posterior portion of pronotum; posterior one-third of mesoscutum with a finer sculpture; parapsidal furrows well defined for their entire length, the posterior portion of each curving slightly outward; scapula dorsally finely reticulately rugose, laterally more coarsely so; axilla delicately reticulated; disk of scutellum rather convex, anterior portion less strongly punctate than the posterior half, which is finely reticulated and somewhat smooth; scutellar cross-furrow inconspicuous; propodeum carinate, reticulately rugose, slightly smooth and polished towards the middle; anterior margin with fairly large impressions or pits; mesopleura cupreous-red; mesepisternum and posterior one-half of mesepimeron reticulated, remainder of mesepimeron smooth and polished; lower half of the posterior aspect of femoral furrow blood-red in direct light; fore coxae mostly green slightly tinted with brown, apex yellow extending farther up on the inner side; midcoxae green, infuscated with brown, tip yellow; hind coxae green, tip yellow; trochanters, femora and tibiae yellow, tarsi lighter bordering on white, apical tarsal joint light brown; mid femora slightly infuscated excepting at apical one-quarter; hind femora heavily infuscated for two-thirds its basal length, lighter on apical one-third than basal tip, center elevation of outer aspect tinted green in some lights; a few long hairs on inside near base; tegulae concolorous with the legs; wing veins brown; submarginal vein about two-sevenths longer than marginal; postmarginal longer than stigmal; stigmal vein petioled; club moderately large, uncus prominent; wings moderately ciliated hyaline.

Abdomen as long as the thorax, violaceous green, with blue reflections; compressed below to keel-like ventral aspect; dorsum of first segment mostly bluish-green; margin of each segment brown and deeply incised medially; first, fourth and sixth more sharply incised than the others; first and second segments dorsally extending further caudad by about half their length than do the marginal flaps; third segment also produced slightly dorsally; remaining segments normal; ventral keel brownish; ovipositor yellow, tip brown; sheaths dark brown approaching black.

Male: Length, 1.5 mm. Abdomen one-half as long as the thorax, hind femora faintly infuscated; fourth tarsal joint tinted brown, fifth joint darker. Otherwise essentially as in the female.

Type locality—Stamford, Conn.
Host—*Caryomyia* sp.
Type—Connecticut Agricultural Experiment Station, New

Haven, Conn.; paratype—United States National Museum.

Described from two females and one male reared from a species of *Caryomyia* gall June 25, 1929, by Dr. E. P. Felt of the Bartlett Tree Research Laboratory, Stamford, Conn. Specimens and description reviewed by A. B. Gahan of the United States National Museum.

STRUCTURAL ANOMALIES IN SPIDERS.

By B. J. Kaston, New Haven, Conn.

Because of their extreme rarity it is thought worthy of noting the following two cases which have come to hand. A young specimen of an amaurobiid, (*Callioplus* sp.?), collected by Prof. A. Petrunkevitch at New Haven, Ct., Apr. 13, 1935, shows a complete absence on the right side of the posterior median and lateral eyes, as well as a reduction in the diameter of the anterior lateral to only half that of its mate. The second case concerns a young specimen of *Castianeira cingulata* (C. L. Koch) collected by the writer at Jordan, Ct., in April, 1936. Here the left posterior lateral eye is missing. But more remarkable still is the fact that the left chelicera is somewhat hypertrophied and bears a palp-like, 2-segmented appendage. It arises from the lateral surface of the chelicera, and resembles in size and proportions the tarsus of the pedipalp, but lacks the claw. In addition, the maxillary endite is reduced in size and fused to the chelicera, thus exaggerating the latter's hypertrophy.

Since the three pairs of indirect eyes of spiders develop from the second embryonic somite it is evident that in the first case cited the right half of this region in the embryo had been injured in some way. The missing eye in the second case might be accounted for by assuming an injury to the left side, a stimulus which somehow also led to the development and persistence of the extra appendage. As the chelicerae are homologous, not with insect mandibles, but with the crustacean second antennae, which are biramous, it is possible that the appendage represents one of these rami. There is also the possibility that the structure represents the rudimentary appendage of the evanescent third cephalic somite which lies between that of the indirect eyes (second) and the cheliceral (fourth) somite.

NOTES AND DESCRIPTIONS OF NORTH AMERICAN BUPRESTIDAE AND CERAMBYCIDAE (COLEOPTERA).

By Edwin C. Van Dyke, University of California,
Berkeley, California.

The notes and a certain number of the descriptions in this paper are the result of my studies in the British Museum of Natural History during the years 1932–1933; the others are due to a restudy of certain species or to new accessions.

Family Buprestidae.

Chrysophana placida Le Conte.

This well known species was at first thought to be fairly stable as to color and physical features but with the acquisition of more material and field knowledge, it has been found to be quite variable. The typical form is of a greenish or blue green color with a bright copper colored vitta, four intervals wide, extending down the middle of each elytron from the humerus almost to the apex. A color phase or variety from the higher levels of the Sierra Nevada Mountains that is entirely green or bluish green and has long been known, has recently been described as the aberration *coerulans* by Obenberger. All degrees of variation between this color variety and the typical bicolored form are represented in our collections. Another color phase which is entirely cupreous with the upper surface generally opaque but the lower brilliantly shining, I will designate as the variety **cupriola**, new variety, labeling a specimen from Atwells Mill, Tulare County, California, collected by myself May 30, 1929, as the holotype (No. 4240 Mus. C. A. S.). In spite of the fact that I have six other specimens of similar coloration, I consider this as but an extreme color variety and in the opposite direction from *coerulans* Obeng. The following form, however, I am describing as a subspecies, for I find that it differs not only as to color, but structurally and biologically.

Chrysophana placida conicola Van Dyke, new subspecies.

Generally much larger than normal-sized specimens of *placida,* proportionally more elongate, with the elytra more attenuated behind, the sides more or less straight and parallel to beyond middle, thence almost straight and convergent to blunt apices; the head, prothorax, entire undersurface and a broad vitta extending from humerus down the middle of each elytron almost to the apex, cupreous or viridicupreous, the middle and sides of the elytra a bright green. The head is coarsely, densely, approximately punctured; the pronotum with the punctures well spaced on the disk, the intervals between about equal to width of puncture, and more contiguous and cribrate at sides; and elytra with the striae in general narrowly and sharply defined, the intervals flat with the punctuation rather coarse, irregular and somewhat dense, and the side margins with the serrations so much reduced in size towards apex that they appear smooth on casual examination. Length 12 mm., breadth 4 mm.

Holotype (No. 4241, Mus. C. A. S.), and eight paratypes, six reared from the cones of the knob-cone pine, *Pinus attenuata* Lemm., collected on Mt. St. Helena, California, the others collected on the same mountain by beating. The holotype bears the date (of emergence), April 25, 1930, one paratype the same date, others March 30, 1930, April 20, 1930, and October 31, 1923. All except two were collected by me, one without date by C. L. Fox and the 1923 specimen by E. P. Van Duzee.

This very distinct subspecies differs from the typical form by being in general much larger, proportionally more elongate and attenuated posteriorly, by having a most distinctive color pattern and more even surface. It seems also to be restricted to the cones of the knob cone pine whereas the other phases live in the twigs, branches or wood of various pines as well as the Douglas fir.

Acmaeodera resplendens Van Dyke, new species.

Moderate in size, elongate cuneate, depressed, brilliantly green, unicolorous, the entire upper surface moderately clothed with rather long, erect, black hair, the under surface with the pile gray, slightly denser and more inclined, especially on the abdomen. Head coarsely punctured behind, more finely, densely and approximately between the eyes, with a small median carina above and shallowly, longitudinally impressed at middle in front, the clypeus deeply emarginate. Prothorax four-ninths wider than long, apex broadly emarginate with front angles prominent, base transverse, sides broadly arcuate behind thence almost straight and convergent to apex; disk broadly, triangularly sulcate at middle, broadly depressed laterally, especially near base, coarsely, deeply punctured, the punctures in median depression more or less approximate, those on carinae well spaced and the lateral both approximate and cribrate, the hind angles small and rectangular. Elytra cuneate, more than twice as long as wide, 9:4, about four times as long as prothorax, narrower at base than prothorax at widest part, basal angles rectangular, sides feebly sinuous in basal half, almost straight and convergent to apices from middle, and with margins coarsely serrulate posteriorly; disk more or less flattened, the suture moderately elevated throughout its entire length, third interval carinate for a short distance near base, fifth carinate from base almost to posterior third and seventh prominent as humeral umbone and sometimes carinate for a short distance behind, the area between suture and fifth intervals flat with the strial punctures gradually coarser outwards, and slightly transversely rugose, the lateral strial punctures very coarse and cribrate. Beneath, the front margin of prosternum sinuate, the general surface shining but with moderate punctuation, the punctures gradually coarser behind and very coarse throughout entire pleural area, the last ventral segment subtruncate at apex and without subapical carina. Length 9.5–12, breadth 3.75–5.

Holotype male, allotype female (Nos. 4242, 4243, Mus. California Academy of Science) and numerous designated paratypes from a series of thirty-five specimens collected by F. H. Parker, September 20, 1935, in the Santa Rita Mountains of Arizona. I also have two more specimens before me, one collected at Summerhaven, alt. 7700 ft., Santa Catalina Mountains, Ariz., by Ian Moore, and another from Madera Cañon, Santa Rita Mts., Ariz., Oct. 8, 1927, collected by Mrs. E. McClellan. The last mentioned specimen is of a greenish bronze color.

This very beautiful species could only be confused among known American species, with *cuprina* Spin. and *viridissima* Chev., the first of which differs by having the punctures of the entire upper surface much coarser, those of the elytra being very gross indeed, and the general surface, both discal and lateral, coarsely reticulate, the basal impression of the pronotum also more semicircular and the color more generally cupreous; while the latter species differs by lacking the elytral carinae. I have two specimens of *cuprina* before me for purposes of comparison, one a typical greenish bronze specimen from Patzquaro, Mexico, Koebele Coll. of the Calif. Acad. of Sciences and another of a deep violet color from Sebastian, Sierra Madeiro Mts., 1800 ft. alt., Jalisco, Mexico, from my own collection now in the Calif. Acad. of Sciences collection.

The specimens mentioned by Le Conte, Horn, and Fall were, I believe, all true *cuprina*.

Acmaeodera simulata Van Dyke, new species.

Rather small, more or less elliptical in shape, shining, with sparse, erect pile dorsally and long white, inclined pile ventrally, aeneous, the elytra with three well marked lateral yellow spots, a small subapical, a longer transverse one, somewhat in front and extending inwards from margin to second interval, and a broader one at the middle, extending from margin to fourth or fifth interval, also often two smaller yellow marginal lines or spots, one between middle and base, often united to median spot, the other posterior to median. Head rather coarsely, discretely punctured, with shallow median longitudinal groove; the clypeus rather deeply, angularly emarginate at apex. Prothorax two fifths broader than long, apex moderately emarginate, front angles fairly prominent, base very feebly emarginate, sides feebly arcuate in posterior half, thence almost straight and convergent to apex; disk moderately punctured, more coarsely and densely at sides, with a well marked median longitudinal depression, deeper at base. Elytra twice as long as broad, over three times as long as prothorax, with base but little narrower than prothorax at broadest part, sides very feebly sinuate from base to middle thence feebly arcuate and convergent to apex, margin serrulate on apical half; disk somewhat flattened, striae defined by moderate sized, elongate punctures, intervals flat with a row of well spaced punctures down their middle, laterally the striae well impressed and the intervals somewhat convex. Beneath, pleura coarsely, closely punctured, elsewhere more finely sparsely punctured and shining, the prosternum retracted at middle, and last ventral segment without subapical carina. Length 8.5 mm., breadth 3 mm.

Holotype (No. 4244, Mus. C. A. S.), collected at Camp Potwisha, Sequoia Nat. Park, Calif., May 18, 1930; paratypes: from Clear Lake, Calif., May 1895; Placerville, Calif., March 3, 1914, bred from *Quercus kelloggi*; same locality, March 31, 1914, bred from *Quercus wislizenii*; Pinnacles Nat. Mon., Calif., Apr. 28, 1914; Pasadena, Calif., June 11, 1916; Mt. Wilson, Calif., May 26, 1918, and Sequoia Nat. Pk., Calif., May 20, 1929. The first two specimens were collected by myself, the Clear Lake specimen from *Quercus kellogii*; the second two by J. J. Sullivan; the Pinnacles specimen by L. Slevin, and the Mt. Wilson and Pasadena specimens by J. O. Martin. The above are all in the collection of the Calif. Acad. of Sciences. The last mentioned specimen belongs in the collection of M. Cazier.

This species resembles *prorsa* Fall in color pattern and has generally been confused with it. It differs, however, in many regards: first, in being generally smaller; second, by being subelliptical in shape as against the markedly cuneate shape of *prorsa* with its prothorax also much more transverse and more expanded at sides; third in having the propleura less coarsely and closely punctured; and fourth, in having the third and fourth antennal segments less elongate and cylindrical and the outer segments about as broad as long whereas broader in *prorsa.* This species as far as we know also breeds in various species of oaks while *prorsa,* I believe, breeds in *Ceanothus,* and is in general more southern in distribution.

Acmaeodera mariposa bernardino Van Dyke, new subspecies.

Similar to typical *mariposa* except as to color and shape of elytral spots, the true species being of a bright blue color with the middle band narrower than the spot in front, while this subspecies is of a dark bronze color, almost black, and with the middle red spot of the elytra distinctly narrower than the preceding one. The typical *mariposa* is confined to a great extent to the foothill regions of the Sierra Nevada Mountains and generally breeds in various species of *Ceanothus,* while the subspecies *bernardino* is more southern in distribution, being confined to the Sierra Madre and San Bernardino mountain ranges of southern California. I have quite a large series of this latter, all much alike, taken in various places such as along Lytle Creek, San Bernardino Co., July 8, 1928; Forest Home, San Bernardino Co., June 12–18, 1928; and Idlewild, Riverside Co., June 28, 1928; all collected by myself from *Ceanothus.*

Holotype (No. 4245, Mus. C. A. S.) from Lytle Creek, San Bernardino Co., Calif., June 8, 1928, and numerous designated paratypes.

This dark bronze subspecies is so distinct in appearance and so well separated geographically that I believe it merits a name. It might possibly be confused with *dohrni* Horn with which it agrees somewhat in color and color pattern, but the latter has a much more generally expanded prothorax. The true *dohrni* is also apparently very rare, while *bernardino* is not uncommon within its area of distribution.

Chrysobothris iris Van Dyke, new species.

Rather small, robust, head, prothorax and apical half of elytra brilliantly cupreous, often with a violet reflection, the basal half of elytra aeneous and generally with greenish cast. Head very coarsely punctured, sparsely pubescent, with a median smooth, elevated occipital line joining a crescent-shaped frontal callosity, the latter irregularly dilated outwardly and with small irregular callosities beneath; the clypeus broadly arcuately emarginate in front. Prothorax somewhat trapezoidal, almost twice as broad as long, apex broadly, feebly lobed at middle, base deeply sinuate with median lobe somewhat triangular, sides rounded at front angles thence generally straight though often feebly arcuate and convergent posteriorly; disk convex, with finely impressed median longitudinal line gradually passing into a shallow sulcation forward, the surface minutely alutaceous and shining, without callosities, and rather coarsely, irregularly punctured, more densely in sulcus, the sides densely punctured and rather broadly impressed. Scutellum small, triangular, impressed in front. Elytra three-sevenths longer than broad, sides feebly sinuate at middle, gradually arcuate posteriorly and convergent to apex, with serrate margin; discal sculpturing very similar to that in *ignicollis* Horn with the subbasal and median callosities broad and quite transverse, the subapical narrow, oblique and irregular, the sutural margin and a parasutural longitudinal carina narrowly and sharply defined posteriorly, the callosities sparsely punctured, but the broad foveae coarsely, deeply punctured in front and more finely, shallowly impressed behind, the general surface alutaceous, shining in front but subopaque apically. Beneath coarsely, rather densely punctured in front, less densely so behind. Length 7–8.5 mm., breadth 3.25–4 mm.

Females with simple, almost straight front tibiae and with last ventral segment very feebly emarginate at apex.

Holotype male, allotype female (Nos. 4246, 4247, Mus. C. A. S.) and numerous designated paratypes from a series of one hundred and twelve specimens, collected by myself, June 28, 1935, near St. George, Utah, from juniper.

This varicolored species belongs in Horn's Group III and according to the male tibial character very close to *speculifer* Horn, with which I was at first inclined to place it as a variety. It, however, differs from this in having the elytral callosities broader and less sharply defined, in this regard more closely resembling *ignicollis* Horn, and in having the punctures of the depressions less coarse and deep in the apical region, whereas they are about equally coarse and deep throughout in *speculifer*. The tribalteate color pattern and duller apical portion of elytra is also very distinctive and in my large series of specimens quite stable. The male tibial teeth is also a bit broader and less acute than in *speculifer*. *Chrysobothris ignicollis* Horn was taken in numbers at the same time and place as the above but could always be separated even in the field by its more uniform elytral coloration. *Chrysobothris piuta* Wick. has a somewhat similar contrasting color pattern as *iris* but is generally smaller and otherwise very different.

Chrysobothris grindeliae Van Dyke, new species.

Small, subcylindrical, bronzed, front of head and antennae in males brilliantly green, sparsely pilose, the pile of upper surface rather long, fine and suberect. Head feebly convex in front, coarsely, densely punctured, finely, sparsely pubescent, with two small callosities between eyes, transversely impressed between antennae, clypeus broadly emarginate. Prothorax one-third broader than long, apex broadly, feebly lobed at middle, base sinuate with well developed median lobe, sides evenly arcuate or more generally somewhat sinuate before hind angles; disk quite convex, somewhat gibbous laterally, rather coarsely, densely punctured, often with transverse rugae, especially near base and at sides, sometimes with vague callosities on either side of middle and rarely a smooth median line, the sparse pile rather long and inclined forwards. Scutellum small, depressed in front. Elytra almost twice as long as broad, barely broader at humeri than prothorax, sides straight or very feebly sinuate to behind the middle, then gradually arcuately narrowed to apex, each elytron individually rounded at apex, and margin serrate apically; disk slightly convex, moderately finely, densely punctured, with foveae as follows: a large and deep one at base of elytra, a shallow lunate depression at humeri, a broad and feeble one in front of middle and two rather small ones about one-third distant from apices, carinae variable, often lacking, at most with three or four feebly elevated, and sparsely clothed with fine, semierect pile. Beneath rather coarsely punctured in front, more finely behind, pilosity denser and suberect in front, sparser and inclined behind; prosternum with shallow lobe in front. Length 6.5–9 mm., breadth 2.5–3.5 mm.

Males with front of head and antennae green, anterior tibiae arched and with blunt tooth on inner face near apex, and last ventral segment broadly, distinctly emarginate.

Females with front of head bronzed, anterior tibiae straight and simple and last ventral segment broadly, feebly emarginate.

Holotype male, allotype female (No. 4248, Mus. C. A. S.) and ten paratypes, ten including the first two, collected at Fairfield, Solano County, Calif., May 27, 1936, by A. T. McClay, from the gum plant, *Grindelia robusta* Nutt., the other two collected at Tracy, San Joaquin Co., Calif., June 2, 1920, by E. P. Van Duzee, also from *Grindelia.* Eight of the paratypes will remain in the collection of Mr. Arthur T. McClay, to whom I am indebted for the privilege of studying the series as well as being granted the opportunity of retaining two of the specimens.

This species belongs in Horn's Group V, and near *deleta* Lec. and *deserta* Horn. It is generally more cylindrical and elongate than either of these, has longer and finer pile, a prothorax that is a bit longer and generally with the sides sinuate posteriorly, a less markedly sculptured surface and finer and less close punctuation. *C. deleta* is flatter, the elytra with closer punctuation and always well defined carinae, and the clypeus more semicircularly and deeply emarginate; while *deserta* is broader, flatter, and more coarsely punctured and sculptured. *C. lixa* Horn, *subpubescens* Fall and *fragariae* Fisher are all smaller, shorter, more flattened, with much shorter pile, and have different biologies, the first two living on coniferous trees and the last in strawberry roots. *C. grindeliae* sometimes has a greenish cast to the body. Its pile is always longer and finer than that to be found on any of the other species of the group.

FAMILY CERAMBYCIDAE.

The genus *Megasemum* Kraatz (1879) will have to replace *Nothorhina* Casey (1912) (nec *Nothorhina* Redt. 1845) for *aspera* (Lec.). This species and *quadricostulatum* Kraatz from Japan, the latter the genotype of *Megasemum,* are undoubtedly congeneric and in fact very closely related. *Nothorhina* Redt. (1845) with *muricata* Dahl. from Europe, also eastern Asia, is rather widely separated from both.

Semanotus (*Anacomis*) *nicolas* White, proves upon examination to be but a dark color phase of *Semanotus ligneus* (Fab.). *Semanotus* (*Anacomis*) *litigiosa* (Csy.) is, therefore, a valid species, not a variety of *nicolas* as I formerly believed and stated.[1] *S. terminalis* Csy. is but a variety.

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[1] Bull. Brooklyn Ent. Soc., XVIII, pp. 49–50, 1923.

Phymatodes rainieri Van Dyke, new species.

Of moderate size, upper surface almost entirely glabrous, shining, piceous, legs lighter in color. Head small, a sixth narrower than prothorax, sides behind eyes straight and parallel, eyes barely projecting laterally beyond side margin, front smooth with a few well spaced fine punctures from which arise fine hairs, deeply triangularly sulcate between the antennae and with a few coarse punctures on either side of groove, clypeus triangular, depressed, rugose, with a few punctures along front margin; antennae robust, about reaching middle of elytra, second segment about twice as long as broad, third one-third longer than second, fourth and fifth gradually longer. Prothorax barely broader than long, sides feebly arcuate, disk smooth and shining, sparsely, finely punctured, more evidently so in front and behind, with a few scattered hairs at sides and laterally behind. Scutellum deeply impressed medially and with a few minute punctures. Elytra two and a half times as long as broad, about three and a half times as long as prothorax, disk rather flattened, suture feebly elevated, surface coarsely punctate, rugose and shining. Undersurface sparsely pilose. Femora clavate as usual. Length 8 mm., breadth 2.5 mm.

Holotype (No. 4249, Mus. C. A. S.), a unique collected by myself in Sunrise Park, Rainier National Park, Wash., July 26, 1936. I believe that it was beaten from fir, *Abies*.

This more or less unicolorous, shining and rather sombre species belongs in the group with *aereum* and *aeneus*, perhaps closer to the latter. Its piceous color, shining appearance, rather narrow, smooth, sparsely and minutely punctured pronotum, and robust antennae are its most distinctive features.

Of the two species of *Xylocrius, agassizi* (Lec.) breeds in the crown and stems of wild gooseberries and at times is destructive to the cultivated varieties as has been found frequently in the Willamette Valley of Oregon and elsewhere; *cribratus* Lec., however, breeds in wild cherries, plums, and similar members of the genus *Prunus*.

Xylotrechus fuscus (Kirby) and *lunulatus* (Kirby) have been found to be but very weak phases of *Xylotrechus undulatus* (Say) as shown by a careful examination of the types in the British Museum of Natural History; differing only in having somewhat reduced markings. What we have considered as *fuscus* in this country is something entirely different, quite divergent in fact from the true *undulatus*. Inasmuch as this species is now without a name. I will name and describe it.

Xylotrechus frosti Van Dyke, new species.

Subcylindrical, reddish brown, and irregularly ornamented with gray and a limited amount of sulphur yellow colored pile arranged about as follows: the yellow pile in patches on either side of middle along front margin of pronotum and in small triangles on either side of middle along hind margin of pronotum; the gray pile on lower portion of head in front, along sides of prothorax, generally in the form of longitudinal arcuate patches on posterior part of disk, these sometimes reduced to spots or even extended to lines passing on to anterior portion, arranged in the form of a vitta along elytral suture, irregularly scattered along sides of elytra and condensed to form a subbasal spot on each elytron, and two transverse, oblique or more often zigzag lines linking the sutural with the lateral vittae, the first at the middle and the second at the apical third, and sometimes in fully marked specimens with two narrow longitudinal lines, often united, between sutural and lateral vittae; the underside rather uniformly clothed with gray pile or as in the case of the abdomen with it condensed along posterior margin. Head with vertical and transverse diameters about equal, the V-shaped median and lateral frontal carinae well marked; the antennae extending two segments in females and about four in males beyond basal margin of elytra. Prothorax two-sevenths broader than long, sides broadly arcuate at middle, base slightly narrower than apex, disk irregularly granulate and rugose. Elytra rather rapidly narrowing towards apex, the latter one fourth narrower than base and obliquely truncate. Legs long. Male, length 12.5 mm., breadth 4 mm.; female, length 12 mm., breadth 4.5 mm.

Holotype male, allotype female (Nos. 4250, 4251, Mus. C. A. S.) and several designated paratypes, the first from Bathurst, New Brunswick, Canada, July 7; the second from same locality, July 5, both collected by J. N. Knull. The paratypes comprise specimens collected at the same locality as above; Monmouth, Maine, June 24, 1910, C. A. Frost from *Abies balsamea;* Ithaca, New York, June 1917, collected by myself; and Paris, Maine, July 14, 1913, C. A. Frost.

This species is rather widely distributed throughout eastern Canada and our northeastern states. It has long been called *fucus* but incorrectly so, first placed as a variety of *undulatus,* later separated and I think correctly so. My good friend and careful collector, C. A. Frost, has, I think, rather definitely proved that this insect differs biologically from *undulatus,* bearing the same relationship to this in eastern North America that *abietis* bears to it on the Pacific Coast. *Xylotrectus frosti* differs in the main from *undulatus* by being generally smaller, proportionally narrower, with basic color more rufous and the gray pile forming a different color pattern as well as being more abundant and more diffused. The color of the pile also varies from the normal gray to fulvous.

Neoclytus kirbyi Auriv. (*longipes* Kirby) as shown by an examination of the Kirby type in the British Museum of Natural History, has also been misunderstood in this country. It is but a very weak color phase of *muricatulus* (Kirby), differing only in having somewhat reduced markings. What we have been considering as *Kirbyi* or *longipes* in this country is unnamed. This I am now describing below.

Neoclytus confusus Van Dyke, new species.

Rather small, elongate, narrow, subcylindrical, dark brown with rufopiceous antennae and legs, the upper surface with gray pile disposed as follows: Long, erect hair scattered over lower portion of head and sides of prothorax; closely applied scalelike hair arranged scatteringly along front and basal margins and as a faint transverse bar across the middle of pronotum, in a more condensed manner as a short bar at base of elytra, just reaching outwardly as far as humeral umbone and sometimes extending slightly backwards along suture, in a lozenge-shaped spot along suture one fourth the distance from apex with lateral patches on either side, a chevron-like bar at middle, not reaching side margin, and a bar somewhat removed from apex that at first extends obliquely back from suture then becomes transverse, and in addition a few scattered scalelike hairs over disk of elytra especially near suture and along sides of metapleura and abdomen. Head coarsely, closely, shallowly punctured; antennae rather definitely clavate, reaching to about anterior fourth of elytra in male and just beyond base of elytra in female. Prothorax subcylindrical, one fifth longer than broad, disk coarsely closely, shallowly punctured, with a longitudinal ridge at middle on which are from four to eight sharply defined, short transverse carinae, the subapical of which is the most prominent, and scattered tubercles, often subcarinate, along side margins and here and there in front, scutellum transverse, black, with a few fine punctures but without noticeable pile. Elytra about three imes as long as broad and with subangular apices. Legs long, the femora clavate, and middle and hind tibiae somewhat arcuate. Male, length 9 mm., breadth 2.25 mm.; female, length 10 mm., breadth 2.75 mm.

Holotype male, allotype female (Nos. 4252, 4253, Mus. C. A. S.) and paratype male from a set of four specimens collected at Rockville, Penn., May 3, 1912, by A. B. Champlain. Numerous other specimens have been examined.

This species is found rather uncommonly throughout most of northeastern North America. It is generally confused with *muricatulus* which has longer antennae, a shorter and broader prothorax, and the white bars on the elytra somewhat different, the first more arcuate, often unbroken, and the median and posterior straight and oblique. I doubt whether *confusus* has ever been found in the territory from which Kirby received most of his specimens.

Two Central American Social Wasps, Accidentally Introduced into the United States.—I have recently received for identification two tropical species of social wasps, taken in the United States under similar conditions. 1. *Mischocyttarus basimacula* (Cameron). Professor H. Jaques, of Iowa Wesleyan College, sent three specimens of this wasp, taken in a grocery store at Mt. Pleasant, Iowa, where they had emerged from the nest in a bunch of bananas. The species is known from Guatemala, British Honduras, the Republic of Honduras and Costa Rica.—2. *Mischocyttarus ater* (Olivier) (Synonym: *M. imitator* Ducke). A female of this species was sent by Mr. Horace N. Marvin, of the Department of Zoology of the University of Wisconsin. It was taken on a bunch of bananas in a store at Madison, Wisconsin. It had just hatched from a nest, which, according to a sketch by Mr. Marvin, consisted of a single, free comb of eight elongate paper cells, of a light brown color, attached by a short stalk. Two complete, capped over cells were 16 mm. long and 4 mm. wide. This wasp is widely distributed throughout tropical America, from Guatemala to southern Brazil.—Attention is called to these two accidental introduction, in order to avoid these and similar cases being included in lists of native insects. They also illustrate again the ease with which certain tropical wasps enter new territory, owing to the rapid modern means of transportation. No doubt some of these introductions might eventually lead to permanent naturalization, where conditions are favorable for further breeding.—J. Bequaert, Harvard University Medical School, Boston, Mass.

THE NUMBER OF MOLTS OF THE FIRE BRAT (LEPISMATIDAE, THYSANURA).

By Harvey L. Sweetman and F. W. Whittemore*

It is well established that certain insects as the Plecoptera Odonata, and Ephemeroptera have 20 or more molts. A recent paper by Ide (1935) suggests that at least one species of may fly has between 40 and 45 molts, and another about 30. A study of the fire brat has revealed that this species exceeds these figures during the life of long-living individuals. However, no definite number of molts can be assigned to the species to reach adulthood. The fire brat molts at frequent intervals and grows throughout much of its life (Sweetman, 1934). The writers have used an arbitrary criterion for assigning adulthood to the females. When the ovipostor becomes visible from a dorsal view, the females are considered mature.

The data shown in the table were secured from observations of specimens hatched and reared at 37° C. and either 75 or 84 per cent humidity. It was difficult at times to determine when an individual had molted. It will be observed that in the table occasional molts were apparently missed. The extra number of days between the recorded number of molts in these instances, strongly indicates that a molt had not been recorded.

The nymphs are clothed with scales after the third ecdysis (fourth instar) and in following instars, except when the scales are rubbed off (Sweetman, 1934). Preceding the third ecdysis the scales on the new cuticle can be seen through the old cuticle for a few hours preceding molting. This was observed by Adams (1933) also. The number of days spent in each instar is shown in the table. Ten of the nymphs were observed during development of the ventral abdominal styli only. One day or less is spent in the first instar, about four in the second, about six in the third and fourth, approximately eight days in the fifth to eleventh, and 10 days in the fourteenth to twentieth instars. The following instars average about 12 to 13 days each.

The first pair of ventral abdominal styli appears at the fourth molt (fifth instar). This is the distal pair of styli. The second pair of ventral abdominal styli usually appears on attaining the seventh or eighth instar. The males do not ordinarily acquire the third pair of styli as do the females, which usually acquire this pair in the tenth instar.

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* Contribution from the entomological laboratory of Massachusetts State College.

No distinctive sex characters were observed on living specimens before the eighth instar, at which time the posterior abdominal sternites begin showing the notched appearance, which lengthens into a definite slit by the time the ovipostor appears. About 10 instars are passed at 37° before the ovipostor is visible from a dorsal view.

Several males were added to the cages containing Nos. 3, 4, 5, and 6, as soon as the ovipositors of these females were visible so as to encourage fertilization. Two of these females reproduced, the first ovipositions occuring in the fourteenth and seventeenth instars. Only one lot of eggs is laid during an instar. The last eggs were laid by these females when in the thirty-fifth and thirty-third instars respectively. The instars during which oviposition occurred are indicated in the table.

The number of instars depends entirely on the length of life of an individual. The six individuals passed through from 10 to 42 instars during their lives. Apparently the molting process constitutes a hazard to longevity, at least under the conditions of the experiment. The older living individuals all died following difficulty in extricating the head and thorax from the old cuticle. Some individuals may be so entangled that they are unable to eat during an instar, yet they may successfully emerge during the following molt. This difficulty occurred in both the 75 and 84 per cent humidity environments. The duration of each instar beyond the twentieth is about 12 to 13 days. This is considerably less than indicated in an earlier paper from less intensive observations (Sweetman, 1934). Other individuals in similar environments have lived much longer than the ones under daily observation. One specimen reached an age of 675 days, and a number lived to within a few days of this figure. If the length of the instars beyond the fortieth remained the same this one was in about the sixtieth instar, and undoubtedly some would live longer. One specimen at 32° is over three years old.

Growth continues long after the ovipostor is visible and after the first eggs are laid. Very little change in size was observed after about the thirtieth to thirty-fifth instars. The numbers of segments of the antennae increase rapidly during the first few instars.

The number of instars during the life of *Thermobia domestica.*

Exp.		Instars—Days in each										
No.	Sex	1	2	3	4	5	6	7	8	9	10	11
1	♂	1	4	6	6″	6+	7	7	8*	8	9	10
2	♂	1	4	7	8″	12+	7	6*	6	9	10	7
3	♀	1	4	6	6″	7+	10	9*	10	11	–‡	(20)
4	♀	1	4	6	6″	6+	7	6*	8	6	9‡	8
5	♀	1	4	6	6″	8+	7	7	7*	7	7‡	8
6	♀	1	4	6	6″	8+	7	8	–*	(16)	10‡	died
7	–	–	–	–	6″	6+	7	6	8*	7	8‡	dis.
8	–	–	–	–	9″	8+	6	6	8*	8	dis.	
9	–	–	–	–	7″	6+	6	8	7*	8	dis.	
10	–	–	–	–	7″	6+	6	8	7*	8	dis.‡	
11	–	–	–	–	6″	7+	6	6	8	6*	8	dis.
12	–	–	–	–	8″	7+	7	7	–*	escaped		
13	–	–	–	–	6″	7+	6	6	8*	6	8	dis.
14	–	–	–	–	10″	5+	4	11	9*	8	dis.	
15	–	–	–	–	9″	6+	–	(18)*	7	8	dis.	
16	–	–	–	–	7″	6+	6	9	6	6	7	–*

(Continued)

Exp.		Instars—Days in each										
No.	Sex	12	13	14	15	16	17	18	19	20	21	22
1	♂	11	7	9	9	8	11	9	11	12	14	8
2	♂	9	8	9	11	11	6	14	—	(21)	14	18
3	♀	10	10	13°	12	9°	11°	12	12	8°	11°	14°
4	♀	10	11	9	9	9	—°	(23)°	11°	10°	13°	10°
5	♀	7	8	—	(23)	12	11	8 died				

(Continued)

Exp.		Instars—Days in each										
No.	Sex	23	24	25	26	27	28	29	30	31	32	33
1	♂	11	10	13	13	13	16	15	—	(30)	12	13
2	♂	13	11	11	14	13	13	13	16	9	13	14
3	♀	12	15	7	12°	14°	13	12°	12°	13°	13	12
4	♀	—°	(21)°	14	12	13	16	11°	12	11°	15	16°

(Continued)

Exp.		Instars—Days in each								
No.	Sex	34	35	36	37	38	39	40	41	42
1	♂	15	12	13	12	14	10	14	12	13 died
2	♂	14	13	—	(27)	—	(22)	7 died		
3	♀	13	13°	12	14	8 escaped				
4	♀	13	14	11	8	13 died				

″ Clothed with scales in the fourth instar and thereafter.
+ First pair of ventral abdominal styli.
* Second pair of ventral abdominal styli.
♯ Third pair of ventral abdominal styli.
° Oviposited during these instars.
dis. Observations discontinued.

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NOTES ON THE INFECTION OF THE SEVENTEEN-YEAR CICADA, MAGICICADA SEPTENDECIM (LINN.) BY THE FUNGUS, MASSOSPORA CICADINA PECK.

By Irving J. Cantrall, Ann Arbor, Michigan.

During the late spring and early summer of 1936, the Seventeen-Year Cicada, *Magicicada septendecim* (Linn.) appeared in the region of Ann Arbor, Michigan in countless numbers. The adults began to make their appearance, in Eberwhite's Woods near Ann Arbor, during the first week in June. On the 14th. of the month the tree tops contained hundreds of singing males. A random collection, made in the shrubbery and undergrowth, revealed that the males were present in the minority (36%). In all probability, the males had preceded the females in emergence and had moved up into the trees, while the females were just beginning to appear in any quantity. On June 21, the emergence had reached its peak. Many pairs were noted in coitu. At this time 47% of the specimens collected were males; the females, at their greatest abundance, were mating, and moving higher up for oviposition.

A fungus infection was noted on this date and 163 living specimens picked at random, were brought into the laboratory. Of this number, 12 males (10%) and 43 females (31%) were noticeably infected with *Massospora cicadina* Peck. An examination of the material collected on June 14 revealed a single female with the end of the abdomen badly distended and partially broken away by the mass of fungus present.

A collection made on June 30, by Charles Steinbach, at a locality but five miles distant from the above, contained 25 males and 128 females of which 3 males and 2 females were noticeably infected. The writer was unable to collect a single living specimen in Eberwhite's Woods on this same day, although a few isolated males could be heard singing.

Although the percentage of error is undoubtedly great in this data, I feel that the following inferences may be drawn:

1—In Eberwhite's Woods, Ann Arbor, during the outbreak of 1936, females of *Magicicada septendecim* (Linn.) were more heavily infected with the fungus, *Massospora cicadina* Peck, than were the males.

2—Females were probably infected before oviposition.

These results are contrary to those obtained by A. T. Speare, 1921. Mr. Speare states, Mycologia, Vol., 13, Pg. 73, "It should be noted furthermore that the fungus seemed to be largely though not exclusively confined to the male insects. Despite the fact that infected insects were observed and collected many times during the season, not more than half a dozen females were observed."[1]

The writer is indebted to Dr. Bessie B. Kanouse, of the University of Michigan Herbarium, for the identification of the fungus, and to Mr. Wm. T. Davis, of the Staten Island Institute of Arts and Science for the correct name of the Cicada.

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[1] Mr. Speare's work was confined to the Washington, D. C. area. Again on page 81, "From the economic viewpoint it must be stated that if the fungus is confined largely to spent males . . . its importance as a natural check to the spread of this insect is almost negligible."

THE LARGE GREEN DRAGONFLY, ANAX LONGIPES, IN THE WOODS HOLE REGION.

By George M. Gray, Woods Hole, Mass.

From all the records I have seen, *Anax longipes* is regarded as an uncommon, or rare dragonfly for this region. There is one record of a specimen of *A. longipes* being taken in Woods Hole by Hagen in August, 1875, and R. Heber Howes, Jr., in his "Manual of the Odonata of New England" mentioned it being seen by Outram Bangs at Wareham, Mass., between 1911 and 1913. Bangs reports, "Seen three or four times, always over ponds, hard to catch." Mr. Howes quotes, "Mr. Bangs is sure that his determination is correct. This is the second New England station for the species."

My first actual acquaintance and experience with this Green Darner was on August 3, 1936, and thereby hangs a tale. The circumstances and events which led up to the taking of this, my first, recognized specimen of the species were so peculiar and I was so impressed with the progressiveness of them that perhaps a narration will not be amiss. They tend to show that the seemingly trivial decisions we make or impulses we act upon may start a train of events, the results of which may have important effect on our lives.

On this particular morning Dr. John Rankin, one of the summer collectors of the Marine Biological Laboratory, spoke to me about going with him to a certain pond which has been a favorite collecting place for many and various forms of animal life.

I arranged to go with him and was getting my equipment together, for I intended to collect dragonflies, when one of the instructors of the Invertebrate Class came to me and said that the class was going to Kettle Cove on Naushon Island that day and wanted me to go with them. Now here was a dilemma! I wanted very much to go on this particular trip, but didn't very well see how I could go on both trips at precisely the same time, when they were miles apart in opposite directions and one by land, the other by water. (Leastwise I could not go on both with any comfort to myself.) I debated a few minutes, then decided to keep to my first arrangement. After a motor ride of several miles, we reached the pond, which from its size might well be called a lake. Rankin started out for the material which he was to get, while I went to a small pond a few rods away to collect

Dragonflies. There were a number flying about and some quite large. I noticed one large one especially, which I took to be *Anax junius.* He was as independent as a traffic cop. He dominated and was domineering over the whole pond, investigating, chasing other dragonflies, seemingly very inquisitive about their affairs, swift and tireless in his movements. I had waded into the pond and when a little distance from shore I noticed this dragonfly was on my side of the pond and very swiftly bearing down upon me. I thought, "He is coming my way. I don't need any *Anax junius,* and I couldn't catch him if I tried."

However, as he got opposite me and going by, the impulse to try for him was too great. I made a quick sweep just as he was passing and was agreeably surprised to hear the familiar rustle of wings in my net. I have no doubt he was equally surprised, and I am sure that I was far more pleased than he. On transferring it from the net to the killing jar, I was impressed with the different general appearance from that of *A. junius.* When I reached home and compared it with *A. junius,* I noted that it was larger, that the wings had a different shade of green, and did not have the bronzy look of *junius.* Also it had the brick red abdomen, different from that of *junius,* and last but by no means least, was the much longer hind femora, several mm. longer than those of *junius.*

I conferred with Dr. C. B. Wilson at the Oceanographic, who has had a deal of experience with dragonflies, and we were both convinced without any doubt that my specimen was none other than the rare dragonfly, *Anax longipes.* I do not now recall at this writing whether it was before or after I had talked with Dr. Wilson that when I entered my laboratory and looked about, lo! and behold! there was a newly emerged specimen just like the one I had that day caught, another *A. longipes!*

In looking back over the events of that day I am impressed with the thought that Fate or Fortune stacked the cards and played into my hands.

During the spring and summer I had been collecting Odonata nymphs, and keeping them in my laboratory, watching them in their transformations. Dr. Rankin had very kindly contributed nymphs which he had collected, and in this way I had secured a number of different forms and it was from one of the nymphs he had taken that this second *A. longipes* came. Unfortunately I could not be absolutely sure of its exuviae as there were a number of *A. junius* exuviae in the same aquarium.

I told Dr. Whedon, who was then at the Marine Biological Laboratory working out some dragonfly problem, and he said that some years before, he had taken, or had had brought to him while at Woods Hole, a specimen of *A. longipes*. He had taken it home to add to his Woods Hole collection of Odonata. Now here was a record of four specimens for this region besides those seen by Bangs in 1911–1913 at Wareham.

This is not all. Among other things for which Woods Hole is noted is the "Children's Summer School of Science," where young children under competent and trained instructors are given a wonderful education in Natural History. The laboratory work is supplemented by field trips and the youngsters gain a wonderful knowledge of out-of-door life. On the last day of school the young students give an exhibition to the public of all the different kinds of work they have done during the summer, and of the specimens they have collected, and these children with their happy, eager smiling faces give you an enthusiasm for both children and Nature.

It was an exhibition of this kind last August that I was looking over when I caught sight of a specimen of *Anax longipes* in the collection of a bright little girl, Patricia Berg. She thought it *Anax junius*. I had a talk with her. She was charming with her eager interest. I asked her about its capture and she told me where she caught it. On asking her if she didn't have hard work to catch it, she said that she hadn't, that she had seen it flying around and when it lit on a bush she put her net over it. It was as simple as that. Later on she presented me with the specimen. This makes a record of five specimens for this region, three of which are in the Marine Biological Laboratory Museum collection. (This is aside from Dr. Bang's Wareham notation.)

Of course it is possible that *longipes* may have been taken by others, but I have seen no record. I have an idea that the pond from which my living nymph came was the same one which yielded a number of *A. junius* nymphs, but I am not sure, as Dr. Rankin collected from a number of ponds. From this pond he also brought me a number of *Tramea carolina* nymphs, only one or two of which, however, transformed to adults. So far as I know, the records for *longipes* are all for the month of August, which would seem to be their normal month of appearance as adults.

THE OCCURRENCE OF DOUBLE BROODS IN NORTH AMERICAN ANDRENID BEES (HYMENOPTERA).

By E. Gorton Linsley, University of California

The occurrence of more than one annual brood in certain bees of the genus *Andrena* has long been recognized in Europe. Aside from its biological significance, this phenomenon is of great interest to the taxonomist, since the two broods may present misleading morphological differences. Before this fact was fully appreciated, the first and second broods of a number of Old World forms were described as distinct species.[1]

Mr. R. C. L. Perkins (1), in his excellent paper on the British species of *Andrena* and *Nomada,* has given an account of the double broods of several European *Andrenae.* He has observed that closely related species occupying the same or similar habitats may differ markedly in their tendency to produce a second brood. Thus *Andrena tibialis* Kirby, a bee which appears in the early spring, is always single-brooded, and its near relative *A. bimaculata* Kirby produces two broods, the first flying with *A. tibialis.* He has also pointed out that a few species, regularly single-brooded in northern England, may be double-brooded in the south, and other species, invariably single-brooded throughout England, produce a second brood in Central Europe. Of approximately sixty species of *Andrena* which Perkins recognized from Great Britain, only eight or nine were regarded by him as regularly double-brooded.

A perusal of entomological literature reveals very little with regard to the occurrence of more than one brood in American species. Apparently the only recorded case is that of *Andrena fulvipennis* Smith, an Atlantic coastal species (distributed from New Jersey to Florida), which has been stated by Viereck (2) to have two broods, one flying in May and the other in September. Dr. Cockerell (3), on the basis of published dates of capture for

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[1] The question may be raised as to the nomenclatorial status of the names thus proposed. In the past they have been variously treated as varieties or subspecies. The forms may hardly be regarded as varieties in the sense of most present day workers (*i.e.,* as color phases and forms of common parentage occurring with the typical species), nor may they be treated as subspecies (*i.e.,* as geographical races). Actually, they are merely seasonal forms of a single species which are isolated in time and in food plant, and the names suggested for them have no real status in nomenclature.

A. kincaidii Ckll., has suggested that the same may possibly apply to that species, although I am not aware that this has ever been verified. In view of the paucity of information on the subject, it would seem of interest to record the fact that at least two species appear to be regularly double-brooded in southern California. These species are *Andrena mimetica* Ckll. and *A. candida* Smith.

Andrena mimetica is a moderately large (10–12 mm.), metallic bluish or greenish species occurring in southwestern United States from New Mexico to California. Examples from the latter state are said to have the wings darker than the form from New Mexico and are generally designated as the subspecies *falli* Ckll. As will be shown below, the second brood of *mimetica* has distinctly darker wings and it is quite possible that this is the form which Dr. Cockerell had at hand when he proposed the name *falli*.

At lower elevations (less than 3000 ft.) in southern California, both sexes of *mimetica* appear in late January or early February and the females fly until March or even April, gathering pollen from *Salix, Brassica,* and other early flowers. A second brood makes its appearance in May and June and frequents *Eriogonum, Cryptantha, Ceanothus,* etc. In the season of 1936, the writer captured both sexes of this species near San Bernardino at *Salix lasiolepis* in the last week of January. About four months later, on May 26, at the same locality, large numbers of freshly emerged males were encountered. These were coursing up and down a roadside row of *Brassica* apparently in search of females, some of which were gathering pollen from a nearby patch of *Cryptantha.* During the same week, high in the San Bernardino and San Jacinto Mountains (6000–7000 ft.) fresh specimens were captured at *Ceanothus* and *Rhamnus.* These latter examples apparently represented the one and only brood at altitudes where the season is too short for a second brood, and agree in general with first brood specimens from the lowlands.

As might be expected from a species as widely distributed as *mimetica* and one which feeds upon pollen from numerous unrelated flowers, there is a considerable range of variation in examples of any one series. Normal variation includes minor differences in punctuation as well as in abundance and color of the pubescence. This variation is great enough to make it difficult to distinguish females of the two broods on any constant characters, although in the second brood the wings are usually darker. Second brood males, however, have a marked tendency toward a larger and more conspicuous process of the labrum, much darker wings, a more uniformly and less coarsely punctured clypeus, and a more closely punctured scutum.

Andrena candida is a smaller species (rarely 9 mm. in length), rather widely distributed over western North America. Like *mimetica,* the species is slightly variable and gathers pollen from many kinds of flowers (including *Salix, Cryptantha, Eriogonum, Rhamnus, Ceanothus, Brassica, Sisymbrium, Eriodictyon, Nemophila,* etc.). Mr. P. H. Timberlake first called my attention to the fact that this species has two broods (at least in the lowlands of southern California), and this has since been verified by personal observation. The first brood appears a little earlier than that of *mimetica* and flies for about the same length of time. The second brood generally emerges in June. As in the latter species, the females of the two broods are less distinct than the males, differing primarily in punctation. Males of the early brood usually have the face covered with black pubescence; those of the latter brood have much of the black hair replaced by white.

Undoubtedly many other California *Andrenae* are double-brooded, at least in the more southern portions of their range. Published dates of capture, however, form an unreliable or insufficient criterion on which to base an opinion. As has been shown above, differences in capture records may result from collections at different altitudes. Other important factors are the possibility of a longevity in a species or of continuous or irregular emergence of a single brood. One of the earliest bees to appear in southern California is *Trachandrena semipunctata* Ckll. This species emerges in early January (occasionally in December), as soon as the willow (*Salix lasiolepis*) begins to blossom. In April the species is still flying (at this time collecting pollen from the late blooming *S. nigra*). Nothing is known of the longevity of the species, but observations suggest that the average flight period of the females in *Andrena* is probably not more than six weeks. Likewise, since there is no distinct break in the dates of capture it hardly seems likely that the April forms represent a second brood. The most probable explanation would appear to be that the species has an irregular or more or less continuous emergence, but further observations are necessary before this conclusion may be accepted.

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(1) **Perkins, R. C. L.**, 1919, *The British species of Andrena and Nomada,* Trans. Ent. Soc. Lond. 218–319, pls. 11–15.

(2) **Viereck, H. L.**, 1902, *Concerning bees,* Ent. News 13: 237–238.

(3) **Cockerell, T. D. A.**, 1931, *Rocky mountain bees*—II. *The genus Andrena.* Am. Mus. Nov. 458: 1–20.

BOOK NOTES.

The Biological Control of Insects, with a Chapter on Weed Control, Harvey L. Sweetman. Pp. i–xii + 1–461, figs. 1–142, numerous portraits, not numbered. (The Comstock Publishing Co., Ithaca, N. Y. $3.75).

As one reads this book, one is astonished that no adequate presentation of so important a subject has been attempted up to this point. Of course, the emphasis on the destruction of man's own creation, that is, noxious insects, has lain in the application of insecticides, for the use of which nothing more was required than the operation of machinery at the proper times. Every biologist knows that the equilibrium of living forms is maintained in nature by many factors—food supply, climate, disease, predatism and other similar forces. But economic entomologists have always taken the easiest way—without blame to them. Yet, visible to all was the success met with in the introduction of *Rodolia cardinalis* to control the San Jose scale. Many years ago—at least 25—Dr. L. O. Howard said to the writer that biological control was to be the great means of doing away with noxious insects. Much scattered work has been done in this field, but it has remained to Dr. Sweetman to write the pioneer volume and to bring together all the scattered work on the subject. How much has been done is shown in his References—over 30 pages of literature on all aspects of the matter.

The treatment of the material ranges from the theoretical basis through resistant hosts, diseases, parasitic animals and insects, methods of introducing and handling parasites and vertebrate predators, and finally, the biological control of pest plants.

Of course, biological control is a long-term work; and to meet instant emergencies, the old-time insecticide methods must still be employed, even though the innocent predators perish with the guilty pests. But as knowledge enlarges, we, who have by our activities interfered with the regulated natural forces, will, by our cooperative labors bring into full sway once more the delicate interplay of nature, which will solve all our problems.

This book of Dr. Sweetman's is replete with basic facts. It is a distinct contribution to insect biology.

Culture Methods for Invertebrate Animals.—A compendium prepared cooperatively by American Zoologists under the direction of a committee from Section F of the American Association for the Advancement of Science. Paul S. Galtsoff, Frank E. Lutz, Paul S. Welch, James G. Needham, Chairman. Pp. i–xxxii + 1–590, figs. 1–84. (The Comstock Publishing Co., Ithaca, N. Y. $4.00.)

A Manual of Entomological Equipment and Methods. Part II, by Alvah Peterson. Pp. 1–334, pls. 139–159. (Alvah Peterson, Columbus, Ohio).

Here we have two works complementary to each other. The first begins with general directions for collecting and culturing and breeding. Then the various Phyla are taken up in order. The Insects fill 259 pages of this work. They might have filled more than this had the board of editors had a greater degree of cooperation. Dr. Peterson, on the other hand, has not relied on special work, but has assembled and classified what has been published. His work is arranged alphabetically throughout by names of authors. However, an index of scientific and common names furnishes the key to any particular insect or group of insects. A second index of equipment and methods is a further aid.

Both these works are invaluable to any working entomologist who deals—as we all should—with the biology of insects.

These three works are a distinct indication of the established modern trend of entomology, away from taxonomy into biology. It is surely not too much to express the hope that our American enthusiasm may not lead us to neglect the recognition of the forms we deal with, for an inquiry into what they do. For, after all, we know that form conditions or arises from activity, and that both form and activity are integral parts of the whole, the living being.

J. R. T.-B.

OUT IN SEPTEMBER

A GLOSSARY OF ENTOMOLOGY—Smith's An Explanation of Terms Used in Entomology, Revised and Rewritten by J. R. de la Torre-Bueno. 10,000 terms; 12,000 definitions, 9 plates. Price, $5., postage extra.

Orders must be sent with remittance to Treasurer, Brooklyn Entomological Society, 28 Clubway, Hartsdale, N. Y.

PROCEEDINGS OF THE SOCIETY.

Meeting of February 11, 1937.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, February 11, 1937, at 8.00 p. m. President William T. Davis in the chair and 11 other members present, namely Dr. Tulloch, Messrs. Buchholz, Cooper, Dietrich, Dietz, Engelhardt, Ragot, Sheridan, Siepmann, Stecher and Dietz; also Messrs. Burton August, J. H. Cohen, Richard Fisco, A. G. Harley, E. Gaster, Max Kisliuk, Jr., George Nicolaides, Pablo Ortiz, Paul Peltier, and G. J. Rau; also, Miss Botsford, Mrs. Dietrich, Miss Dietz, Miss Harley, Mrs. Kisliuk and Miss Thibodeaux.

The minutes of the previous meeting were read and approved; Mr. Engelhardt reported informally for the Publication Committee, stating that the first portion of the *Glossary* had already gone to press.

Mr. Engelhardt proposed for membership, Mr. Henry Dietrich, 1086 North Broadway, Yonkers, New York, and Mr. Otto Buchholz, 430 South Euclid Avenue, Westfield, N. J. A motion was made that the By-laws be suspended, and that the society proceed with their election; this motion was seconded and carried, and the candidates for membership were duly elected.

Mr. Davis mentioned that Mr. Dietrich, besides being now a member of the Brooklyn Entomological Society, was also a member of the "Maybe So Club." This club originated during a collecting trip in the woods near Mobile, Alabama, in 1931, which ended with a watermelon party and general discussion of things entomological. The participants in this discussion were reluctant to admit the truth of each other's contentions, and to avoid prolonged arguments, it was agreed that when there was a difference of opinion, the parties would admit "Maybe so" rather than try to argue it out. This gathering was thereupon dubbed the "Maybe So Club." Others present at this memorable gathering include Messrs. Davis, Engelhardt, H. P. Löding and Van Aller.

Dr. Tulloch spoke on the mosquitoes of Puerto Rico, illustrating his talk with lantern slides showing the situations in which the mosquitoes breed, and apparatus for collecting them.

Puerto Rico is about 150 miles long by 50 miles wide. In spite of its small size, however, there is considerable variation in the amount of rainfall. The island is mountainous, with a narrow coastal plain extending around the island. In places this plain is from 12 to 15 miles wide, while in others the mountains come right to the sea. The amount of arable land is small, but it supports the second densest population in the world: some 512 persons per square mile if it were evenly distributed, with much greater concentration in the cities.

The occurrence of mosquitoes and the prevalence of malaria is affected by the variation in rainfall in different parts of the island. The southern coastal plain is practically a desert, with less than 50 inches of rainfall a year. Immediately north of this, and before the mountains, the rainfall averages 50 to 75 inches. In the central mountain region the rainfall is generally from 75 to 100 inches annually, though in one section the rainfall exceeds 150 inches, and there are only twelve days a year, on the average, on which there is no rain. The northern coast has a rainfall of from 50 to 75 inches.

The various situations in which mosquitoes breed in Puerto Rico may be classified into about seven general types:

1. *In towns around dwellings.* Water accumulates in gutters, cisterns, and in stone crocks which are customarily piled in such a way that water can accumulate in their bases. Open sewage canals are frequent, and flanked by a luxurious vegetation which retards the evaporation of water. In such situations breeds the mosquito which carries the filarial worm, a nematode parasite which causes filariasis or elephantiasis, a disease chacterized by obstruction of the lymphatic vessels and swelling of the legs. The yellow fever mosquito, too, occurs in such situations. Due to rigid quarantine, however, there has been no yellow fever in Puerto Rico since 1900, although it occurs in adjacent parts of South America only a short distance away.

2. *Situations in open country.* Sugar-cane is the important crop of Puerto Rico, and reservoirs are constructed so that water can be let into the cane fields when wanted. The water in these reservoirs is quiet; algae are present, and floating plants cover much of the surface. The malarial mosquito breeds in this type of situation. The water for irrigation is brought long distances through irrigation canals. Vegetation grows along the edges of the main canals, and while the people tend to clean off the edges of these ditches, conditions remain favorable for the development of the malarial mosquito. In the smaller ditches which lead off from the main irrigation canals there is always a great accumulation of plants, and mosquito larvae are very numerous. As many as 500 larvae may be taken with a single dip of the net. A new species of *Mansonia,* only two species being previously known,

was discovered in this type of situation. The mosquitoes of this genus, instead of coming to the surface for air as most mosquito larvae do, get their air from the tissues of aquatic plants. Favorable situations for the development of mosquitoes also occur in shallow ponds of water that accumulate in the coconut groves, and in the ornamental ponds on the larger estates.

3. Crab Holes. The holes made by crabs living in the coconut groves provide a breeding place for mosquitoes. A special apparatus, consisting of a hose, a bottle and an ordinary hand pump which is made to suck by reversing the plunger, is necessary for obtaining the mosquito larvae from crab holes.

4. Tree Holes. The mango is a common tree in Puerto Rico, and it frequently has openings in the trunk in which water can accumulate. In this situation occurs *Megarhinus puertoricensis.* It is among the largest mosquitoes known. The larvae is predatory, feeding on other mosquito larvae, but it can hardly be said to have any economic value as a control since only one other species of mosquito lives in the tree holes with it.

5. Leaf Bases of Plants. In the damp forest regions water accumulates in the leaf bases of various plants, such as the elephant ear, in sufficient quantities for mosquitoes to develop.

6. Bromelia plants. The *Bromelia* grows on the Sierra Palm in the rain forest. The leaf bases of this plant are favorable for the development of two or three species of mosquito larvae, but they are not of economic importance.

7. Salt Water. Puerto Rico was at one time submerged, and has risen from the sea in comparatively recent geologic times. Salts are still present in the soil, and cane can be grown only where leaching has taken place. In the drier regions, where drainage is poor, water accumulates and salt-water pools form. *Aedes sollicitans,* famous as the "Jersey Mosquito," which in the United States is associated with tidal marshes, occurs as much as ten miles from the ocean in Puerto Rico. In the dry season the rivers flowing to the sea are often impounded in their own watercourse. Occasional waves wash over into the river, causing the water to become brackish. Nine species of mosquitoes occur in such situations.

Dr. Tulloch told of the method used for collecting and estimating the number of mosquitoes. A small horse is put in a screen covered cage around 6 o'clock in the evening and left over night. The cage is so arranged that the mosquitoes can readily enter, but find their way out with difficulty. The next morning the mosquitoes are collected and classified, and three or four thousand individuals a night is an average haul.

There are four species of *Anopheles* mosquitoes in Puerto Rico, three of which are known to transmit malaria. There are three types of the malarial organism, and all three occur in Puerto Rico, but one is the most common. In the mountainous regions, where the rainfall is heavy, malaria is not a problem. In the foothills and the dry regions on the northern coast, malaria is sometimes a problem in rural areas. In the southern coastal region, the driest part of the island, malaria is a general and a serious problem. Thus, in Puerto Rico, malaria is associated with the irrigation of sugar-cane, rather than with the drainage of excess water.

Dr. Tulloch made a comparison of the mosquitoes of Puerto Rico with those of Alaska, on which subject he addressed the Brooklyn Entomological Society in April, 1935. In general, he said, as one goes northward, the number of species of mosquitoes decreases, while the number of individuals increases. This was borne out in the comparison of Puerto Rico and Alaska. In Alaska there are fourteen species of mosquitoes representing four genera, while in Puerto Rico some ten or eleven genera contribute about 30 species. While in Alaska one cannot go outdoors in comfort during the summer without a net as protection from the mosquitoes, no one ever wears a net in Puerto Rico. In Alaska mosquitoes occur for only two or three months of the year, while in Puerto Rico they occur for twelve months. In Alaska the mosquitoes are of large size, while those of Puerto Rico are rather small.

A general discussion of mosquitoes followed Dr. Tulloch's talk. Mr. Cooper asked whether the difference in the population of Alaska and Puerto Rico, per square mile, might not account for the apparent difference in the number of individual mosquitoes occuring in these places. If the number of mosquitoes were the same per square mile in both places, there would be much fewer mosquitoes per person in Puerto Rico than there would be in Alaska. A discussion of accurate methods of estimating the number of mosquitoes present in a given locality was discussed.

The meeting adjourned at 10.10 p. m.

Carl Geo. Siepmann,
Secretary.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

BUY OR EXCHANGE: Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, College of the City of New York, New York City.

EXCHANGE OR FOR SALE.—*Catocala herodias* (Gerhardi), *Graptolitha viridipallens* and others. Wanted: Rare N. A. Macro-Lepidoptera. F. Lemmer, Lakehurst, N. J.

WANTED.—North American CHRYSIDIDAE for exchange or determination, with privilege of retaining duplicates. W. G. Bodenstein, Dept. Entomology, Cornell University, Ithaca, New York.

Vol. XXXII OCTOBER, 1937 No. 4

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXXII October, 1937 No. 4

NEW RECORDS OF LEPIDOPTERA FROM NEW YORK.

By Alexander B. Klots, College of the City of New York, New York, N. Y.

As in previous lists of additions to the New York State List by the writer, there have been prefixed to the various records "state," "local," or "date"; these signify respectively "addition of the species to the state list," "a new locality record in the state," and "a new date record in the state." Additional records for species known to be of wide and uniform distribution have not been included. The Barnes & McDunnough Checklist numbers have been given whenever possible.

Family MICROPTERYGIDAE.

local 8481 *Micropteryx auricrinella* Wlsm. Bedford (Westchester Cy.) 2 June 1934

Family ERIOCRANIIDAE.

local 8477 *Eriocrania auricyanea* Wlsm. Yaphank 17 May 1913 (coll. by G. P. Engelhardt)

Family PYROMORPHIDAE

local 4876 *Acoloithus falsarius* Clem. Fishers 9 July 1933

Family TINEIDAE

local 8231 *Scardia approximatella* Dietz, Bedford 15 July 1934
state 8250 *Tinea apicimaculella* Chamb. Yonkers 19 June 1936
local 8282 *Tinea auropulvella* Chamb. Bedford 15 July 1934
local 8237 *Monopis rusticella* Huebn. Rochester 30 July 1933
local 8312 *Diachorisia costisignella* Clem. Fishers 21 July 1933
local 8301 *Hybroma servulella* Clem. Bedford 15 July 1934
local 8197 *Amydria effrenatella* Clem. Yonkers 7–19 June 1936

OCT 8 1937

Family PSYCHIDAE

local 4809 *Solenobia walshella* Clem. Honeoye Lake 14 May 1933

Family OPOSTEGIDAE

local 8419 *Opostega albogaleriella* Clem. Rochester 30 July 1933; a dark gray variety

Family GRACILARIIDAE

state 8070 *Gracilaria minimella* Ely, Yonkers 19 June 1936
local 8071 *Gracilaria fraxinella* Ely, Rochester 2 April 1933; a number of specimens hibernating among the roots of a windfallen tree.
local 8011 *Parectopa salicifoliella* Chamb. Rochester 2 April 1933; as above.
local 8006 *Parectopa pennsylvaniella* Engel, Fishers 21 July 1933
local 7894 *Lithocolletis basistrigella* Clem. Yonkers 17 Aug. 1936

Family OECOPHORIDAE

local 6505 *Borkhausenia ascriptella* Busck, Fishers 21 July 1933

Family GELECHIIDAE

local 6411 *Symmoca novimundi* Busck, Yonkers 23 Sept. 1935
local 6296 *Gelechia pseudofondella* Busck, Bedford 15 July 1934
state 6201 *Anacampsis levipedella* Clem. Yonkers 24 July 1934
local 6355 *Trichotaphe flavocostella* Clem. Woodlands (Westchester Cy.) 17 July 1934
local 6364 *Trichotaphe juncidella* Clem. Yonkers 19 June 1936
local 6379 *Dichomeris eupatoriella* Chamb. Rochester 30 July 1933
local 6074 *Telphusa latifasciella* Chamb. Ithaca 3 July 1931; Gannett Hill (vic. Naples) 4 July 1933
local 6044 *Aristotelia rubidella* Clem. Yonkers 17 Aug.–14 Sept. 1936
local 6058 *Aristotelia quinquepunctella* Busck, Yonkers 17 June 1935
local 6062 *Evippe prunifoliella* Champ. Cold Spring Harbor, L. I. 8 July 1931 (C. H. Curran)

Family LAVERNIDAE

local 6006 *Laverna brevivittella* Chamb. Fishers 13 July 1933
state 6017 *Laverna murtfeldtella* Chamb. Yonkers 14 Sept. 1936
local 5985 *Walshia amorphella* Clem. Woodlands 7 Aug. 1934
local 5984 *Stilbosis tesquella* Clem. Bedford 15 July 1934
local *Cosmopteryx magophila* Meyr. Woodlands 4 July 1934

state 5956 *Cosmopteryx pulchrimella* Chamb. Ithaca 19 May–4 June; Rochester 30 July 1933

Family YPONOMEUTIDAE

local 7675 *Plutella porrectella* L. Woodlands 24 May 1935
local 7650 *Cerostoma falciferella* Wlsm. Oswegatchie 31 March 1933 (coll. by J. D. Hood)
local 7711 *Argyresthia undulatella* Chamb. Rochester 9 July 1933

Family GLYPHITERYGIDAE

local 7607 *Simaëthis pavonacella* Clem. Woodlands 7 Aug. 1934
local *Choreutis gnaphaliella* Kearf. New York Botanical Garden, N. Y. City; boring in *Anaphalis* sp.; emerged July 1934
local 7608 *Choreutis inflatella* Clem. Kanahwauke Lake, Bear Mt.-Harriman State Park, 11 Aug. 1934

Family AEGERIIDAE

local 6715 *Conopia pyralidiformis* Walk. Rochester 31 July 1933

Family TORTRICIDAE

state 7249 *Laspeyresia garacana* Kearf. Yonkers 28 May 1935
local 7321 *Sereda lautana* Clem. (in State List as *Laspeyresia lautana*) Coram, L. I. 28 April 1934 (coll. by E. L. Bell)
state 7127 *Epinotia momonana* Kearf. McLean Bogs 12 July 1931
state 7038 *Epinotia madderana* Kearf. Rochester 8 July 1933
local 7175 *Anchylopera subaequana* Z. Rochester 31 July 1933
local 6981 *Epiblema strenuana* Walk. Yonkers 28 May–17 Aug. 1936
local 6988 *Epiblema brightonana* Kearf. Rochester 30 July 1933
local 7016 *Epiblema obfuscana* Dyar, Yonkers 28 May–12 June 1935
local 6957 *Epiblema suffusana* Z. Yonkers Aug. 1936
local *Eucosma derelicta* Heinr. Yonkers 19 June–17 Aug. 1936
local 7063 *Thiodia ochroterminana* Kearf. Yonkers 14 Aug.–14 Sept. 1936
local 7075 *Thiodia raracana* Kearf. Rochester 31 July 1933
local 7062 *Thiodia imbridana* Fern. Yonkers 12–26 Aug. 1936; very common
local 7061 *Thiodia olivaceana* Riley, Bedford 15 July 1934; Yonkers 19 June 1936

state 7152 *Thiodia crispana* Clem. Yonkers 17 Aug.–14 Sept. 1936; very common.
local 7171 *Strepsicrates indentanus* Dyar, N. Y. City 26 July 1934 (coll. by F. E. Watson); the first definite record from the state.
local 6971 *Sonia constrictana* Z. Yonkers 19 June–17 Aug. 1936; very common.
local 7116 *Gretchina deludana* Clem. McLean 21 May 1933
local *Gretchina derelictana* Heinr. McLean 21 May 1933
state 7167 *Gretchina watchungana* Kearf. Honeoye Lake 7 May 1933
local 6830 *Olethreutes auricapitana* Wals. McLean 14 July 1931
state 6860 *Aphania removana* Kearf. Fishers 13 July 1933; Rochester 30 July 1933
local 6797 *Exartema* (*Cymolomia*) *zelleriana* Fern. Bedford 15 July 1934
local 6801 *Exartema punctana* Wals. Bedford 15 July 1934
local 6784 *Polychrosis yaracana* Kearf. McLean 27 May 1931
local 7303 *Sparganothis irrorea* Rob. Bedford 15 July 1934
state 7300 *Sparganothis demissana* Wals. Bedford 15 July 1934
local 7410 *Argyrotoxa bergmanniana* L. Naples 4 July 1933
local 7409 *Argyrotoxa albicomana* Clem. Yonkers 19 June 1936
local 7409.2 *Argyrotoxa semipurpurana* Kearf. Bedford 15 July 1934; Yonkers 19 June 1936
local 7427 *Peronea angusana* Fern. L. Tiorati, Bear Mt.-Harriman State Park 11 Aug. 1934 (coll. by V. Tiship)
local 7416 *Peronea cervinana* Fern. Fishers 24 Sep. 1933
state *Peronea forbesana* McD. McLean Bogs, bred from leaf-rolling larva on *Cornus paniculata,* emerged 24 June 1930
local *Torticodes fragariana* Busck, Yonkers 10 Sep. 1936
local 7394 *Eulia pinatubana* Kearf. Scottsville 8 May 1933
local 7396 *Eulia mariana* Fern. Scottsville 30 May 1933
local 7399 *Eulia juglandana* Fern. Bedford 15 July 1934
local 7364 *Eulia quercifoliana* Fitch, Bedford 15 July 1934
local 7363 *Archips conflictana* Walk. Yonkers 19 June 1936
local 7340 *Archips rosana* L. Yonkers 14–18 June 1936 common
local 7343 *Archips infumatana* Z. Bedford 15 July 1934
local 7354 *Archips semiferana* Walk. Yonkers 19 June 1936
local 7387 *Archips grisea* Rob. Yonkers 19 June 1936
local 7336 *Pandemis limitata* Rob. Yonkers 17 Aug. 1936

Family PHALONIIDAE

local 7487 *Phalonia oenotherana* Rly. Rochester 3 July 1933; Fishers 21 July 1933

Family PYRALIDIDAE

local 5285 *Arta statalis* Grt. Bedford 15 July 1934; common

local 5450 *Paralispa terrenella* Z. Bedford 15 July 1934

local *Loxostegopsis merrickalis* B. & McD. Bedford 15 July 1934

local 5217 *Elophila fulicalis* Clem. Bedford 15 July 1934

local 5226 *Diathrausta reconditalis* Wlk. Bedford 15 July 1934

local 5264 *Herculia thymetusalis* Wlk. Bedford 15 July 1934

state 5339 *Crambus lyonsellus* Haimbach; this was accidentally omitted from the State List; the type locality is Katonah, Westchester Cy., "June & July." It is a good species, related to *Pascuellus floridus* Z. There are two specimens in the American Museum, ex Pearsall coll., from Big Indian Valley, Catskill Mts., 23 and 28 June.

local 5338 *Crambus pascuellus floridus* Z. Rochester 16 June 1932; Big Indian Valley, Catskill Mts., 3 July 1905 (A. M. N. H.). This is certainly not specifically distinct from the European *pascuellus* L. and is of doubtful validity even as a race.

local 5347 *Crambus bidens* Z. Rochester 8 July 1933

local 5372 *Crambus teterrellus* Zinck. Yonkers June–Sept. very common; Rockville Center, L. I. 25 June 1936 (A. G. Richards, Jr.). The first definite records for the state; possibly the species is extending its range northward.

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NEW SPECIES OF PTYCHOPTERIDAE (DIPTERA).

By Charles P. Alexander, Amherst, Mass.

The Dipterous family Ptychopteridae includes flies that are commonly confused with the true crane-flies, Tipulidae, yet are abundantly distinct. In this paper I describe two new species of *Ptychoptera* that have come to my attention in recent years, the types being preserved in my personal collection.

Ptychoptera pendula sp. n.

General coloration of mesonotal praescutum and scutum polished black; scutellum obscure yellow; knobs of halteres infuscated; femora yellow, the tips narrowly blackened; wings with a faint brown tinge, the prearcular and costal portions a little more yellowish; no dark pattern excepting a narrow seam on cord; *r-m* before fork of *Rs;* abdomen black, the caudal margins of the segments narrowly pale; hypopygium black; male hypopygium with lateral lobes of tergite short and broad; dististyle prolonged into a slender compressed yellow blade that hangs pendant.

Male.—Length, about 8–9 mm.; wing, 8–8.5 mm.; antenna about 4–4.4 mm.

Female.—Length, about 9 mm.; wing, 9 mm.

Rostrum reddish brown; mouthparts obscure yellow; palpi brown. Antennae (male) about one-half the length of body; scape and pedicel obscure brownish yellow; flagellum black; flagellar segments cylindrical, with short scattered verticils. Head polished black.

Pronotum obscure yellow. Mesonotal praescutum and scutum polished black; scutellum obscure yellow, parascutella darkened; mediotergite black, the surface microscopically alutaceous. Pleura black, gray pruinose; dorsopleural membrane brownish yellow. Halteres yellow, the knobs infuscated. Legs with the coxae yellow, the fore and hind pair narrowly darkened on basal portions; trochanters yellow; femora yellow, the tips narrowly but conspicuously blackened; tibiae yellow, the tips more narrowly blackened; tarsi passing from brown to black. Wings with a faint brownish tinge, the prearcular and costal portions a little more yellowish; no pattern except for a narrow brown seam on cord; veins brown. Macrotrichia at wing-apex involving the cells beyond the general level of the fork of cell R_4. Venation: *r-m* connecting with *Rs* some distance before fork; fork of M_{1+2} about one-third to two-fifths as deep as cell R_4.

Abdomen polished black, the caudal margins of the intermediate segments narrowly pale; hypopygium black, excepting the pendulous lobes of the dististyle which are yellow. Male hypopygium with the lateral tergal lobes short and broad, the apex truncate and with a subacute tooth or lobule at mesal apical angle, this directed mesad; median notch of tergite subcircular or only slightly transverse. Dististyle prolonged into a compressed yellow blade that hangs pendant; at base with a slender arm that terminates in an acute spine, the surface with strong scattered spinous setae; beyond this lobe with a slightly shorter dusky lobe that is slightly expanded at outer end, the surface with abundant setigerous tubercles.

Habitat.—Colorado.

Holotype, ♂, Green Mountain Falls, near Manitou, altitude 8300 feet, June 27, 1934 (C. P. Alexander). *Allotopotype,* ♀, June 26, 1934. *Paratopotypes,* 3 ♂♂, June 26–27, 1934. *Paratypes,* 2 ♂♂, Monarch Pass, altitude 10,500 feet, July 1, 1934 (C. P. Alexander).

Ptychoptera pendula is generally similar to *P. minor* Alexander (western United States), agreeing in the small size and general appearance, differing in the coloration of the abdomen and structure of the male hypopygium.

Ptychoptera lenis coloradensis subsp. n.

As in the typical form, differing in the small size and slight details of structure of the male hypopygium. In the latter feature, the tergite bears a slender glabrous spine shortly before the apex of each lobe lying in the axil of the elongate cylindrical lobule borne on the ventro-mesal face of each tergal lobe.

Male.—Length, about 7–8 mm.; wing, 7–8 mm.

Female.—Length, about 8.5–9 mm.; wing, 8–8.5 mm.

Holotype, ♂, Mount Avery, Gothic, Colorado, altitude 10,000 feet, July 5, 1934 (J. Hallahan). *Allotopotype,* ♀. *Paratypes,* ♂ ♀, Monarch Pass, Colorado, altitude 10,500 feet, July 1, 1934 (C. P. Alexander); Gothic, Colorado, altitude 9500–10,000 feet, July 5–12, 1934 (C. P. Alexander); Salida, Colorado, altitude 7500 feet, June 30, 1934 (C. P. Alexander).

I believe the small Rocky Mountain representative of *Ptych-*

optera lenis Osten Sacken (Bull. U. S. Geol. Surv., 3: 206–207; 1877) should be considered as subspecifically distinct from the Pacific Coast form. In size and general appearance, the present form is much like *P. pendula* sp. n., but the mesonotum is not as polished black as in the latter, being a dull grayish black with the praescutal striae somewhat more distinct. The male hypopygia of the two species are entirely distinct.

Ptychoptera madagascariensis sp. n.

General coloration yellow, including the entire thoracic pleura; mesonotal praescutum black, with a conspicuous central pale stripe; scutellum yellow; mediotergite darkened on posterior third; wings subhyaline or weakly yellow tinged, with a narrow dark seam on cord; abdomen chiefly yellow, the caudal margins of the tergites darkened.

Male.—Length, about 8.5–9 mm.; wing, 6.5–7 mm.; antenna, about 4.3–4.5 mm.

Described from alcoholic specimens.

Rostrum and palpi pale yellow. Antennae 15-segmented, relatively long, about one-half the length of body; scape, pedicel and first flagellar segment yellow, the remaining segments brown; flagellar segments nearly cylindrical, with short verticils. Front yellow; posterior sclerites of head brownish black.

Pronotum uniformly yellow. Mesonotal praescutum polished black, with a conspicuous median paler stripe; scutum black, irregularly paler on lateral portions; scutellum yellow, parascutella black; mediotergite yellow on cephalic two-thirds, the posterior portion black. Pleura uniformly yellow. Halteres yellow. Legs with the coxae and trochanters yellow; femora yellow, their apices restrictedly darkened, more conspicuously so in the paratype specimen; tibiae and basitarsi obscure yellow, the tips narrowly darkened; outer tarsal segments brownish black. Wings subhyaline or very faintly yellow tinged; prearcular field and cells C and Sc light yellow; a narrow but distinct brown crossband on cord, extending from origin of Rs to $m\text{-}cu$; veins dark. Macrotrichia of cells relatively sparse, involving cells R_2 to M_3, inclusive, more or less restricted to outer third or less of the cells. Venation: Rs short, straight, less than $r\text{-}m$; R_{2+3} running very close to R_1 so the latter cell is unusually narrow, while vein R_2 is reduced to a point and cell R_2 to a narrow strip; $r\text{-}m$ and basal section of M_3 in alignment; cell R_4 approximately one and one-half to two times as deep as cell M_1; cell *1st A* wide but relatively short.

Abdomen chiefly yellow, the caudal margins of the tergites darkened; hypopygium brown. Male hypopygium with the tergite profoundly incised medially, each lateral arm bearing a low tubercle beyond midlength. Dististyle long and slender, with a long setiferous lobe at about one-fifth the length and a much shorter and smaller pale lobe on the same face just beyond one-third the length.

Habitat.—Madagascar.

Holotype, alcoholic ♂, Nanisana, 1933 (G. Olsoufieff); through Dr. G. C. Crampton. *Paratopotype,* alcoholic ♂.

This is the first species of *Ptychoptera* to be discovered in the Malagasian Subregion. It is very distinct from the six species hitherto made known from continental Africa, south of the Sahara, these being as follows:

Ptychoptera africana Alexander (1920); Southern Nigeria.
P. camerounensis Alexander (1921); Cameroun.
P. capensis Alexander (1917); Natal to eastern Transvaal.
P. ghesquierei (Collart) (1935); Belgian Congo.
P. hopkinsi Edwards (1932); Uganda.
P. uelensis Alexander (1928); Northern Belgian Congo (Uele).

Besides the above, the only species of the genus from Africa is the Palaearctic *P. surcoufi* (Séguy), described in 1925 from Algeria.

In the present fly, the coloration of the thorax and the venation, especially the very narrow cells R and R_2, together with the greatly reduced vein R_2, are distinctive.

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A SECOND NEW POTAMOBATES FROM PERU, S. A., WITH NOTES ON OTHER SPECIES (HEMIPTERA—GERRIDAE).*

By H. B. Hungerford, Lawrence Kansas

I described recently *Potamobates peruvianus,* the first species recorded for Peru. This was collected by F. Woytkowski in the vicinities of Sani Beni and San Pedro. The same energetic collector has now sent me a second species new to science, which I name in his honor.

Potamobates woytkowskii n. sp.

(See Plate II)

Size: Length of wingless male 12.8 mm.; of wingless female 12 mm.

Color: Wingless forms only known. Black with light brown markings above; venter pale. Head light brown above with a diamond shaped black spot. Antennae dark brown to black, beak black tipped. Anterior lobe of the pronotum has a pale brown triangular spot on dorsum and a silvery patch on the side behind each eye; the mesonotum with three longitudinal light brown figures—the lateral ones roughly triangular and the median stripe constricted behind its middle, the caudal end broadest; lateral margins with longitudinal silvery stripe and silvery patches on meso- and meta-acetabula; abdominal dorsum black except for some silvery pubescence laterally; all coxae, and dorsal side of front trochanters and femora pale like the venter; front legs otherwise black, middle and hind legs brown, the femora longitudinally striped, above and below with black lines; connexivum black beneath except for a brown spot sometimes present on the fifth segment and the distal half of the sixth may be brown.

Structural Characteristics: Antennal formula of male holotype: 1st: 2nd: 3rd: 4th:: 10.5: 3.5: 3.6: 4.8. First antennal segment distinctly longer than the width of the head through the eyes, tip of beak barely attaining anterior margin of front coxae. Pronotum a little shorter than the length of the head. Mesonotum of the wingless male about 2.8 times as long as pronotum measured on median dorsal line; a median depressed line on caudal third of mesonotum. Front femora moderately incrassate, with small peglike projection on the underside near distal end. Front tarsus of male one-fourth length of the tibia; the first tarsal segment a little less than one-third as long as the second. Formula for intermediate leg of male:—femur: tibia: tarsus:: 18.5: 12.3: 7. The first tarsal segment more than three times as long as the second. Formula for the posterior leg:—femur: tibia: tarsus:: 18.6: 10: 1.3. Posterior tarsus small, first segment longer than the second. The last abdominal tergite of the male slightly longer than the two preceding. In the male the connexivum is triangularly produced behind. In the female the connexivum is produced into a long, finger-like process, thicker in its distal half, somewhat incurved, and nearly as long as the last five abdominal tergites. The first genital segment of the male measured on the median dorsal line nearly as long as five preceding abdominal tergites. The general shape of this segment like that of *P. peruvianus* Hungerford, but having the caudo-lateral angle produced into a broad, usually notched curved expansion, much larger than the toothlike projection above it, thus giving two broad triangular projections as viewed from the right side. The hook-like projection of the second genital shaped much like that of *P. peruvianus* Hungerford but broader with its dorsal margin curled inward. The first dorsal genital of female broadly triangular, bluntly rounded at caudal angle. The last ventral abdominal segment of the female (first genital) large, thickened and left half produced caudally into a broad, flat variable plate as long as basal half. In some specimens the tip of this lobe attains the caudal fifth of the fingerlike projections of the connexiva. (See plate II.)

Location of types: Holotype, allotype and paratypes in the Francis Huntington Snow Entomological Museum, University of Kansas. This species described from eight males and eight females, all wingless, labeled "Peru, S. A., Sept. 9 to Oct. 3, 1936. F. Woytkowski, No. 3682. Vicinity Rioja, Department of San Martin, Jungle 900 meters above sea level."

Comparative notes: While related to the *Potamobates tridentatus* Esaki group, the species is easily recognized by the two broad projections on the right side of the distal margin of the first genital of the male and by the enlarged and extremely asymmetrical last ventral abdominal segment of the female.

Potamobates tridentatus Esaki.

Potamobates tridentata Esaki, Ann. Mus. Nat. Hung., XXIII, p. 251, 1926. We have specimens of this species collected at Ft. Clayton, Canal Zone, by Captain R. F. Edwards. Previously the species has been known only from Costa Rica.

Potamobates horvathi Esaki.

Potamobates horvathi Esaki, Ann. Mus. Nat. Hung. XXIII, p. 254, 1926. This species which has been recorded from Colombia, Honduras, and Guatemala is represented in our collections by long series from Punta Gorda and Río Grande, British Honduras; from Ft. Clayton, Canal Zone, taken by Captain Edwards and from Lancetilla, Honduras, taken by John Deal.

Potamobates williamsi Hungerford.

Potamobates williamsi Hungerford, Bull. Brook. Ent. Soc., XXVII, p. 228, 1932. This species was described from Tena and Mera, Ecuador, from specimens taken by Doctor F. X. Williams in 1923. I recently received specimens from the Río Napo watershed taken by Clarke-MacIntyre. The females of this species are readily distinguished from those of *P. tridentatus* Esaki by the first dorsal genital which is triangular in *P. williamsi* Hungerford with caudal end bluntly rounded where as in *P. tridentatus* Esaki the caudal end is a long, twisted finger-like process.

Since I described *P. williamsi, P. peruvianus* and *P. thomasi* without drawings, I am adding them on the plate which accompanies this paper.[1]

PLATE II.

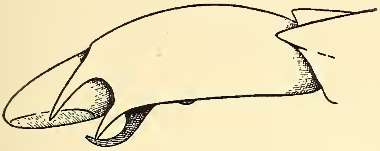
A SECOND NEW POTAMOBATES FROM PERU—HUNGERFORD.

1. *Potamobates williamsi* Hungerford—right side of male genital segments.
2. *Potamobates peruvianus* Hungerford—right side of male genital segments.
3. *Potamobates woytkowskii* Hungerford—ventral view of female abdomen.
4. *Potamobates woytkowskii* Hungerford—right side of male genital segments.
5. *Potamobates thomasi* Hungerford—left side of male genital segments.
6. *Potamobates thomasi* Hungerford—ventral view of female abdomen.
7. *Potamobates thomasi* Hungerford—ventral view of male genital segments.
8. *Potamobates thomasi* Hungerford—dorsal view of female abdomen.

---

[1] *Potamobates peruvianus* Hungerford 1936 Bull. Br. Ent. Soc., XXXI, pp. 178–180.

Potamobates thomasi 1937 Jl. Kans. Ent. Soc., X, pp. 63–65.



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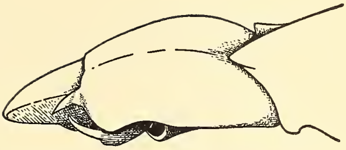

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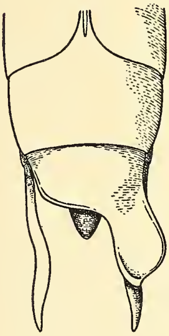

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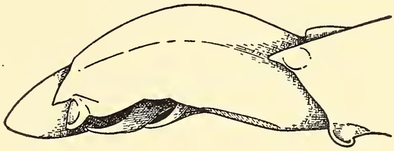

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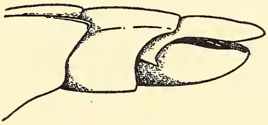

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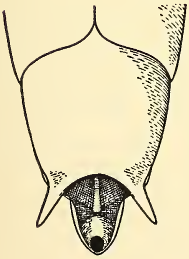

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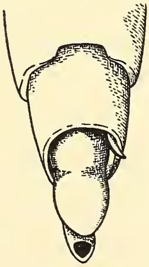

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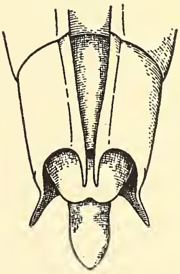

P. thomasi

Drawn by P. Levercault

A NOTE ON THE LONGEVITY OF THE BEETLE, DYNASTES TITYUS LINN.[1]

By Phil Rau, Kirkwood, Missouri.

On November 10, 1935, Professor Joseph Casteli of the Pacific Missouri High School brought me five large Rhinoceros beetles that one of his students had dug out of a rotten oak log. In the can with the beetles was a large amount of rotten wood which served as food for them.[2] The beetles had only recently transformed from the pupal stage, and several of them had bits of the shedding skin still clinging to the appendages. A sixth beetle, a male, died in the process of transformation. During the winter the beetles fed on the wood, and reduced large portions of it to frass. They always remained hidden in the depths of the debris and only on rare occasions came to the surface. I buried pieces of raw potato and apple in the large glass fish globe in which they were confined but they refused to eat anything but the rotten wood.

On June 1st there was a change of heart and the beetles came to the top and remained there almost continuously until they died; they were quite active most of the time and several of them during June assumed copulatory positions, but actual mating was never seen to occur. At this time they ravenously ate any fruit such as apple, plum, cantaloupe, and banana that I placed within their reach; they, however, still refused to eat raw potato. The proportion of sexes were unequal—3 males, 2 females, and the beetle that had died in the pupal stage was a male. The beetles had a long adult life period, living from 8 to 10 months, their deaths occurring as follows: July 10, female; July 12, male; July 25, male; August 21, female; September 3, male.

This seems to be a southern beetle working its way northward, and it is only within the last few years[3] that two specimens were taken by me at light, although Blatchley records their appearance in Indiana.[4]

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[1] Kindly identified by Dr. E. A. Chapin.

[2] The rotten wood was always kept moist by sprinkling with water.

[3] After twenty-five years collecting in the St. Louis region my first *D. tityus*, a male, was taken at light on August 9, 1931.

[4] Blatchley, Coleoptera of Indiana, p. 994.

SOME NEW AND LITTLE-KNOWN NEOTROPICAL AND SUBTROPICAL STRATIOMYIDAE.

By Maurice T. James, Colorado State College, Ft. Collins, Colo.

For some time I have had in my possession specimens representing two undescribed genera of Clitellariinae, but have refrained from describing them, with the hope that the specimens in question might be referred to some Old World genus. Since that seems impossible, I am now following the usually rather undesirable course of erecting two new monotypic genera in this subfamily, and of making a monotypic segregate of the Stratiomyine *Cyphomyia.* These three forms are so distinct that such a step seems warranted.

STRATIOMYINAE.

Cyphomyia varipes Gerst.

The following is a description of the male.

> ♂. Quite similar to the female except in the structure of the head and, of course, sexually. The eyes are contiguous for a third or more of the distance between the antennae and the ocelli; the face, frontal, and vertical triangles are yellow, the ocellar triangle and occiput, except for a brief continuation of the vertical area, black; the white silvery pile covers almost all of the face and extends onto and covers practically all of the occiput, but is sparser and more appressed above; it is longest on the cheeks. The pile of the body is slightly longer in places and more plentiful.

1 male, Aserri, Costa Rica, 600 m., IV 1906 (P. Biolley) (Colo. State College Col.). Also 2 females, same data, 3 females, Barro Colorado, Canal Zone, VII 24, 25, 27, 1924 (N. Banks) and 1 female, Chiriquí (C. W. Johnson).

In the male described above, as well as in the females from the same locality and from Chiriquí, certain pleural areas and the venter may appear somewhat reddish in certain lights, though normally metallic blue.

Cyphomyia banksi, new species.

In superficial appearance, this species seems identical with *varipes,* but under the microscope the following characters appear.

> (1) The eyes are regularly and rather densely covered with short, white pile. (2) the eyes are smaller and the occipital

orbits correspondingly broader; the occipital orbits, at their broadest point, are about two-fifths the width of the eyes (one-fourth in *varipes*). (3) The front is rounded (flattened in *varipes*) and not longitudinally sulcate. (4) The posterior rim of the occipital orbits is not sharp, but rounded; similarly, the division between the occipital orbits and the vertex is not marked by a furrow, but only weakly defined. (5) The terminal (10th) antennal segment is about as long as the preceding one (one-half as long in *varipes*). (6) There is a definite tuft of black pile on the face just below the antennae. (7) The thoracic dorsum and scutellum have, in addition to the appressed yellow pile, a considerable quantity of erect, black pile, longest on the scutellum; this also extends to the abdomen, where it is mixed with pale pile. (8) The scutellar spines are narrowly and abruptly yellow at the tip (in *varipes,* largely yellow or reddish, that color gradually merging into the blue). (9) The first two segments of each tarsus are whitish.

As in *varipes,* the body is metallic blue, the head wholly yellow, the antennae black, the femora yellow with an abrupt change to black on about the apical third, the tibiae black, the apical tarsal segments (but to a different extent) black, and the wings infumated. Length, 10–12 mm.

Holotype: female, Barro Colorado, C. Z., July 17, 1924 (N. Banks). Paratopotypes: 18 females, same date; 1 female, June 24, 1924.

Cyphomyia willistoni (Enderlein) (*C. lasiophthalma* Will. 1900 nec. Will. 1896), with somewhat similarly marked femora and pilose eyes, is much different; it has a black head and body, the antennae are yellow basally, the wings hyaline with a brownish band across the middle, the abdomen is marked with areas of appressed white hair, etc. The coloration of the femora will readily distinguish these three species from the other described ones.

Gyneuryparia Enderlein, which was distinguished from *Cyphomyia* merely on the basis of the hairy eyes, is not valid, since closely related species may differ whereas more distant ones will agree in this respect; moreover, the eyes may be pilose in the male and not so in the female. The same thing will apply to such genera as *Psellidotus, Hirtea,* and *Acrodesmia,* based on *Odontomyia, Stratiomys,* and *Hermetia,* respectively, with hairy eyes. Eye pilosity seems to be a very unsafe character on which to base generic differences in the *Stratiomyidae.*

Dicyphoma, new genus.

Related to *Cyphomyia*, but readily distinguished by the short scutellar spines, which are barely one-fourth as long as the scutellum, are set toward the outer angles of the trapezoidal scutellum, and arise from below, being directed upward and outward. The first antennal segment is twice as long as the second; the flagellum eight-segmented, the segments gradually decreasing in length, the terminal one set slightly at an angle to the remainder: the eyes are pilose, contiguous in the male, separated in the female, the front of the female has two transverse calluses, almost contiguous medially, a short distance above the antennae, and a small tubercle between each of these and the ocelli. The general appearance is that of *Adoxomyia* rather than of *Cyphomyia*.

Type, *Dicyphoma schaefferi* (Coq.) (*Cyphomyia schaefferi* Coquillett).

Dicyphoma schaefferi (Coq.).

The male has not been previously described.

♂. Black, varied with yellow as in the female, but the frontal triangle, which is very small, has only a suggestion of yellow; eyes densely long black pilose; face rather strongly rounded, with abundant long black pile in addition to the appressed tomentum; thorax with a considerable amount of pile, varied black and pale yellow, on the dorsum, pleura, and scutellum; and the abdomen yellow pilose laterally at the base, this pile being in addition to the usual pollen. Otherwise, except sexually, as in the female.

Male, Donna, Texas, April 1, 1934 (J. W. Monk). A female, Donna, Texas, April 11, 1934 (Monk) agrees perfectly with Coquillett's description. A character not mentioned by Coquillett is the presence of a bare, polished, streak on each pleuron running from the base of the anterior femora to the notopleural suture in such a way that the femur might, when at rest, be appressed against it.

CHRYSOCHLORINAE.

Chrysochlora flavescens, n. sp.

Runs in Curran's key (Amer. Mus. Nov. 339,2) to *incompleta* Curran, but the pile of the body is entirely pale, the thoracic stripes are not black, the abdomen is uniform in color dorsally, etc.

♂. Entirely yellow, except as follows: Ocellar triangle and occiput, except the median fifth, black; thorax with three broad vittae on the dorsum, a spot on each mesopleuron, and the pectus, ochraceous; basal half of scutellum ochraceous; abdomen, except the basal ventral segments, ochraceous. Pile entirely yellow; that of the head rather long and dense; that of the dorsum almost golden. Wings yellow-fumose, the costal area definitely darker than the remainder, but evenly infumated. Length, 10–16 mm.

Holotype: male, Yucatán (G. F. Gaumer). In the Snow Entomological Collection, University of Kansas.

Paratypes: 14 specimens, apparently all males, same date.

In this genus it is often impossible to distinguish the sexes when the genitalia are missing, as they are in three of the paratypes.

CLITELLARIINAE.

Dieuryneura, new genus.

Evidently related to *Euryueura,* but differing in so many respects that there is no question whatsoever as to the generic distinctness of the two.

Head slightly broader than the thorax; the occipital orbits in the female well defined but rather narrow above, broadening into the cheeks below, in the male wanting; vertex and upper part of front, in the female, of approximately equal width, almost as wide as the length of the antennae, the front below and the face widening out, considerably; eyes of male broadly contiguous, distinctly divided into areas of larger and smaller facets. Eyes bare. Antennae inserted definitely below the middle of the eyes, in the female the point of insertion almost on a level with the lower ocular margin; eight-segmented, the basal one slightly longer than broad, the second a little shorter than the first, the remaining ones consolidated into a flagellum, of which the first three annuli are robust and bear sensory pits, the fourth one is tapering, the fifth very short, ring-like, the sixth style like, set at an angle with the remainder. Female above the antennae with two large calluses, which are almost contiguous but separated by a distinct furrow; in the male, these occupy the whole of the frontal triangle. Proboscis short, with fleshy, ciliated labella, and set in a broad, flattened, triangular area which is distinctly margined. Scutellum large, triangular, with the two spines set approximate to each other at the apex; the spines very short, directed straight back, but slightly upcurved at the apex.

Venation similar to that of *Clitellaria* (*Ephippium*) and *Lasiopa villosa,* but vein r-m is almost punctate, and R_{2+3} is situated beyond the apex of the discal cell; the discal cell is rather large, subtriangular, the union of Cu_1 with the discal cell is very short, and the three branches of the media are distinct to the wing margin; M_2, M_3, and Cu_1 from the discal cell are almost straight, except at their apices. Abdomen flat; excluding genitalia, about as long and as broad as the thorax.

Genotype, *Dieuryneura callosa,* new species.

Dieuryneura callosa, new species.

♂. Head black, except for an indistinct pair of yellow spots below the antennae; this color, however, is variable, as the black may be brownish-black, and the antennae, palpi, proboscis, and oral area may be partly or wholly yellow. Calluses bare, shining; vertical triangle, occiput, face, and cheeks clothed with moderate dense, short, appressed white pile, with some erect white hair on the cheeks and lower part of the occiput. Thorax, including scutellum, black, except for the shining metascutellum uniformly clothed with appressed pile similar to that of the head; a little erect pile on the upper part of the pleura, especially anteriorly; the humeri are reddish, and there may be some brownish-black on the postalar calluses, pleura, and scutellar spines. Abdominal pile short and inconspicuous, except for silvery lateral tufts at the posterior corners of segments two to four inclusively; the background obscured by silvery pollinose triangles medially on segments one to five, all connected along the median line, those on segments one and five large. Legs variably brown to black, but the basitarsi always distinctly paler yellow. Basitarsi long, the first and third definitely longer than the remaining tarsal segments: the posterior basitarsi about two-thirds as long as their tibiae. Wings grayish hyaline, darkest at apex and along the posterior margin; stigma brown, large; veins strong, brown. Halteres yellow, their knobs white. Length, 10 mm.

♀. As in the male, but the front is clothed with rather dense, short, white pile, the yellow spots below the antennae are more evident, the basitarsi are pale only basally, and the lateral pilose spots of the abdomen are less evident.

Holotype: male, Baboquivari Mts., Ariz. (F. H. Snow), in the Snow Entomological Collection.

Allotype: Tucson, Ariz. (Snow), in the Snow Entomological Collection.

Paratypes. 2 females, Tonto Nat. Monument, Ariz., July 26, 1932 (R. H. Painter); male, female, Santa Rita Mts., Ariz. (D. K. Duncan); male, Globe, Ariz. (Duncan); male, Palmdale, Calif., July 6, 1933 (R. H. Beamer).

Platopsomyia, new genus.

♂. Head slightly broader than the anterior margin of the thorax, definitely flattened dorsoventrally; ocellar triangle tuberculate; eyes subtriangular in lateral profile, broadly contiguous, definitely divided into areas of larger and smaller facets. Antennae inserted near the lower margin of the eyes, about as long as the head, eight-segmented; the first and second segments short, about as long as wide; the remaining segments consolidated into an eight-annulated flagellum, the terminal three annuli of which form a fairly well defined style, which, by virtue of the elongation of the terminal annulus, is longer than the remainder of the flagellum; the terminal annulus as long as the preceding four, rather robust, tapering gradually to a point, with a small terminal hair. Scutellum unspined. Abdomen somewhat longer than thorax and slightly broader, flattened. Radial sector angularly bent at the cross-vein; r–m very short; R_4 wanting; R_{2+3} almost as long as the width of the discal cell; the media with three strong branches, the anterior two reaching the margin, the third one abruptly terminating a short distance from the margin; the union of the discal cell with the fifth posterior about equal to that with the fourth posterior cell; the vein separating the basal cells, except near its apex, evanescent.

Holotype, *Platopsomyia flavida,* new species.

Platopsomyia flavida, new species.

♂. Eyes reddish-yellow; the narrow vertical triangle, ocellar triangle, occiput, proboscis, and palpi bright yellow; face and frontal triangle a dull yellow; antennae black, the basal three annuli of the flagellum yellow on the inner side. Face with rather thick, short, white hair. Thorax, including the scutellum and the coxae, trochanters, and femora, reddish-yellow; anterior tibiae and tarsi blackish, locally merging into yellow; the middle tibiae and tarsi testaceous yellow, except for the apices of the tibiae and the three apical tarsal segments, which are black; posterior tibiae brownish-yellow, the first two tarsal segments pale yellow, the remaining ones black.

Pile of thorax and legs yellow, rather scarce, fairly dense on the pleura and pectus; that of the tarsi thick, stubby, yellow to golden; a little black pile on the hind tibiae. Abdomen dull black, somewhat reddish-yellow at the base laterally, especially on the venter; the yellow regions are not clearly defined, and the black in places shows a brownish tinge. Pile yellow, longest on the dorsum, where it is intermixed with a considerable amount of black pile. Wings dusky-hyaline, the apex beyond the stigma rather strongly infumated near the costal region; stigma and veins, except for the evanescent basal part of the media, brown. Length, 7 mm.

Holotype: male, Stgo. de las Vegas, Prov. Habana, Cuba, June 28, 1931 (A. Otero). E. E. A. Cuba. Ento. No. 10415.

PHOTOGRAPHING INSECTS

Insects may be photographed in their natural environment or as prepared specimens. For the former I have found nothing better than a camera with a fast lens and a focal plane shutter, such as my own Graflex, which has the advantage that the objects may be focused up to the time the shutter is released. Although objects will not focus clearly at a distance greater than two feet from the camera, so that the resulting image is rather small, sufficient contrast may be obtained for enlargement. Properly preserved insects or their parts may be, with a little artistry, arranged to produce rather lifelike pictures. For these a 4/5 Tessar lens with a focus of 72 mm. is used with artificial light and special attention given to background. Sometimes special preparation of the specimen is required. For instance, to photograph the divided eyes of *Gyrinus* it was necessary to first decolorize the eyes and then place the specimen in a mixture of alcohol and water with the head directed toward the camera. Pictures have been made from slides by substituting a compound microscope for the camera lens and using transmitted light. Chitinous parts photograph especially well, perhaps because they contrast well with a blue-green light filter. These pictures serve a practical purpose in that from them lantern slides are made to assist in teaching.—Cyril E. Abbott, Chicago, Ill.

NOTES ON CERTAIN NAMES IN USE IN THE VESPILLOIDES GROUP OF NICROPHORUS FAB. (COLEOPTERA: SILPHIDAE).

By Hugh B. Leech, University of California, Berkeley.

The following remarks apply to certain names which are at present in use for North American material of the *vespilloides* group of *Nicrophorus* Fab., and are based on a study of 261 specimens from the United States, Canada, Alaska and the Yukon Territory. In addition, 40 examples of *vespilloides* Hbst. from various places in the British Isles, Europe and Japan have been examined. I have been unable to find any constant character of value in separating our North American specimens from *vespilloides* Hbst., and prefer to consider them as that species, with *defodiens* Mann. as a melanic subspecies occurring on the Pacific Coast to the west of the influence of the Coast Range, and on the northern Islands of Japan. Portevin (1924, 1926) gave our material specific rank, as *defodiens*; but the characters which he used to separate it from *vespilloides* do not hold when a large series is studied.

N. defodiens Mann.: the type locality for this is Sitka, Alaska. It is reasonable to suppose that Mannerheim's material represented the melanic coastal form of *vespilloides*; this is upheld by the description of his Var. b.; "elytris maculis sex parvis aurantiacis, fascia nempe antice in maculas duas irregulares interrupta et macula tertia ante apicem transversim oblonga"; specimens such as this, in which the black markings predominate so strongly, do not occur east of the coast mountain range. It should be noted that in the above quotation, Mannerheim considers the *anterior* fascia to be represented by two irregular golden spots. In his description of the typical form he says: "fascia media dentata maculaque postica antrorsum tridentata aurantiacis," and by *median* fascia he must surely mean the black band, and not the anterior orange fascia, for he compares *mortuorum* Fab. (=*vespilloides* Hbst.) by saying: ". . . et fasciis angustioribus magis dentatis distinctus," which is true of the black, but not of the orange banding, of typical *vespilloides* as compared with the melanic Pacific Coast subspecies. Hatch's interpretation of typical *defodiens* as a form with a broad uninterrupted orange fascia, a narrow median black band, and large posterior spots, occurring in "Me., N. Y., Ont., Minn., Dakota" (1927b) and "eastern Washington" (1934) seems open to doubt.

N. hebes Kby. and *pygmaeus* Kby.: through the kindness of Dr. K. G. Blair I have specimens which were compared by him with

Kirby's types in the British Museum. Each has the humeral ends of the hypomera orange, in *pygmaeus* the orange spot being completely isolated by an extension of the basal black band; both run to the aberration *humeralis* Hatch of Hatch's keys (1927 a, b), and this last name would seem to be unnecessary. A series of specimens from Alaska (Rampart, Ahatanika) and the Yukon Territory (Dawson) also belong here.

N. conversator Walk.: as I have already suggested (1934), Portevin, followed by Hatch, has misidentified the typical markings of this. I have a specimen from Walker's type series, and which has been compared with the type by Dr. K. G. Blair. It runs in Hatch's key to the ab. *gaigei* Hatch, or to ab. *lateralis* Port., depending on one's interpretation of the character "inner end of anterior fascia reduced." It is probably the same also as Mannerheim's *defodiens Var. b.* Walker's type series contains specimens, all from one locality, covering the aberrations *lateralis, gaigei,* and *conversator* of Hatch's key.

The type locality for *conversator* is not given in the original description. The specimens are labelled "Slecy Station, British Columbia"; Dr. Blair has looked up the Museum register number for the material, and quotes the entry: "They were collected by Mr. J. K. Lord, Assistant Naturalist under Lt. Col. Hawkins, R.E., Her Majesty's Commissioner for defining the Boundary Line between British Columbia and American Territory in Oregon." There is no official record of a "Slecy Station" in British Columbia, and it is highly probable that the name is Lord's own spelling for the triangulation station which was located on Sleese mountain in the survey and delimitation of the International boundary along the 49th parallel. Sleese mountain, B. C. (long. 121° 36′, lat. 49° 01′ 30″), is about eight and one-half miles west of the south end of Chilliwack lake, and two miles north of the International boundary.

N. nunemacheri Hatch: this aberrational name would appear to be more accurately spelled *nunenmacheri,* since it was named after the collector, Mr. F. W. Nunenmacher of Piedmont, California. The first spelling will probably stand.

N. binotatus Port.: in Portevin's key this name calls for an aberration in which the posterior orange spot is absent and the anterior fascia represented only by a discal spot on each elytron. Hatch's key places it under "Posterior spot small. Anterior fascia continuous, constricted."

N. mannerheimi Port.: Portevin's key places this aberration in a division "Fascie antérieure divisée en deux de chaque côté." Hatch's key says "Anterior fascia constricted."

I would suggest that, for the following reasons, specimens of *Nicrophorus vespilloides* Hbst. from North America are not suited to a minute classification based on the variations in color pattern: (1) examples occur in which the markings of one elytron are quite different from those of the other, (2) a large series from several localities will show every imaginable gradation in the relative sizes of the various orange markings, (3) the progeny of a single pair of the beetles may illustrate a number of "aberrations" (sensu Portevin and Hatch).

At least six "aberrations" of value equal to those already described could be named from the material studied. In addition, there are many specimens which are directly intermediate between two or more of the named variants. If it is found necessary to give a name to every variation in color pattern, then it would be highly desirable that the describer publish a figure of each one; for it is not at all easy, especially when working with long series, to single out examples to fit the somewhat ambiguous statements in which certain colored areas are described as "constricted," "reduced," "small," et cetera.

Acknowledgements: Dr. K. G. Blair has very kindly compared specimens with types in the British Museum. Through the generosity of Mr. E. P. Van Duzee and Drs. E. C. Van Dyke and F. E. Blaisdell, I have had full use of the collections housed in the Californian Academy of Sciences. Prof. G. J. Spencer of the University of British Columbia has loaned specimens from that Institution, and Dr. F. Kermode similarly from the Provincial Museum. In addition the following persons have kindly lent series from their collections: Mr. R. Hopping of Vernon, B. C.; the late Mr. F. S. Carr, of Medicine Hat. Alta.; Mr. J. B. Wallis, of Winnipeg, Man.; and Mr. J. F. Brimley, of Wellington, Ont. I am much indebted to Dr. M. H. Hatch for copies of his publications.

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FOOD HABITS OF ALYDINE BUGS (HEMIPTERA: COREIDAE)

By Stanley W. Bromley, Stamford, Conn.

A note by Mr. J. R. de la Torre-Bueno in the December, 1936, number of the Bulletin of the Brooklyn Entomological Society, p. 208, on *Alydus eurinus* Say feeding on carrion, recalled such instances which have come to my notice of Coreid bugs of the subfamily Alydinae feeding on decomposing animal or fecal matter. These notes are here recorded.

Megalotonus 5-Spinosus (Say). 1. Found with beak inserted in mouse, a week or ten days dead. Southbridge, Mass., Sept. 5, 1910.

2. Found with beak inserted in a patch of partially dried human excrement. Southbridge, Mass., July 8, 1911.

3. Two found with beaks inserted in dried raccoon dung. Poundridge, N. Y., June 28, 1935.

4. Found with beak inserted in partially dried human excrement. Stamford, Conn., July 2, 1936.

Alydus eurinus (Say). 1. Found with beak inserted in mouse, a week dead. Southbridge, Mass., Sept. 3, 1910.

2. Found with beak inserted in mouse, a week or so dead. Southbridge, Mass., Sept. 4, 1910.

3. Found with beak inserted in carcass of dead cow, a week or more dead. Cassadaga, N. Y., June 24, 1924.

4. Found with beak inserted in dead chicken. Stamford, Conn., June 25, 1935.

These observations reveal a rather strange departure from the usual phytophagous habits of this group of insects; *Alydus eurinus* for instance is usually seen puncturing the heads of bush-clover, *Lespedeza capitata* Michx.

DIPTEROUS PARASITES OF SPIDER EGG SACS.

By B. J. Kaston, New Haven, Conn., and G. E. Jenks,
Los Angeles, Calif.

So far as is known, dipterous "parasites" of spider egg sacs are actually egg predators, the maggots not completing their development within a single egg but lying free in the sac among the eggs. The first recorded case was that of a *Tachina* sp. reared by Bertkau (1880) from *Epeira cornuta.* König (1894) reported that C. Koch had reared *Ogcodes sanguinea* Latr. and *O. trigramma* Loew from the egg sacs of *Tegenaria,* but all other rearings of Cyrtidae have been as parasites from within the bodies of the spiders themselves (Kaston, 1937).

Among the Phoridae, *Megaselida epeirae* (Brues) was reared by Brues (1902, 1903) from *Epeira* sp. The same species was obtained by Auten (1925) from *Epeira sclopetaria.* Through the courtesy of Mr. P. A. Berry, of the New Haven laboratory of the U. S. D. A. Bureau of Entomology and Plant Quarantine, we were enabled to examine an egg sac of *Argiope aurantia* parasitized by *Megaselida* sp. This sac was collected by T. Duffy at Westport, Conn., on May 7, 1937. Starting May 14, there emerged from this sac seven specimens of *Megaselida* (as well as four of *Pseudogaurax anchora,* see below), and a few spiderlings. When examined on May 17, no larvae of *Megaselida* remained, but one puparium was found, from which the imago emerged May 18. The puparium (figs. 9, 10) is reddish brown, 3.2 mm. long, 1.3 mm. at its widest part, and 1.2 mm. high. There is a distinct lateral ridge, and a pair of long thin processes arising on the dorsal surface. There are 6 tubercles on the ventral surface of the last segment, and a pair of smaller tubercles is present on each segment near the lateral border of the dorsum. When the imago emerges, the puparium splits as shown in figure 11.

Among the Sarcophagidae, *Sarcophaga davidsoni* Coq. was recorded by Coquillett (1892) and Davidson (1894) from *Phidippus opifex* McCook. In the intensive study made by Auten, specimens of *S. hinei* Aldrich were reared from *Philodromus canadensis* Emerton, *Epeira sclopetaria* and *Aranea frondosa* (= *Epeira cornuta*). On July 2, 1935 at West Haven, Conn., a female of the latter species was collected in alcohol together with the two egg sacs over which it was standing guard. Sometime later when the sacs were opened for the purpose of counting the eggs, it was discovered that one of them contained a few ready-to-emerge spiderlings, a few shriveled eggs, and four larvae of *Sarcophaga* sp. (*hinei*?), which had eaten all the remaining eggs. The larvae (fig. 1) were all of about the same size and stage of development, 7.5 mm. long, 3 mm. maximum width and 2.4 mm. at the greatest thickness.

From a comparison with the description given by Knipling (1937) for *S. cistudinis* it would appear that they were in the third, or last, instar. There is a rather deep posterior cavity in which lie the two spiracular plates (fig. 4). Each is bordered by a ventrally incomplete peritreme, and has three slits. Each of the prothoracic spiracles has 22 small lobes or branches. At the anterior end of the head there is a pair of tubercles on each side. The cephalopharyngeal skeleton (fig. 3) is shorter and higher than that figured by Knipling. The oral hooks are toothed, and the lateral cornua are not connected posteriad with the dorsal.

It is from among the Chloropidae that we have the most numerous records of parasitism. *Pseudogaurax signata* (Loew),[1] first reared by Davidson (1896) from *Epeira angulata* and *Latrodectus mactans,* and later by Coquillett (1898) from *Argiope aurantia,*[2] were again obtained from *L. mactans* in considerable numbers by Jenks (1936). Herms *et al.* (1935) report a Chloropid from *L. mactans* which is presumably *P. signata.* The life history of this species has been given by Jenks in several popular magazines, and recently by Kessel and Kessel (1937). *P. lancifer* (Coq.) was bred from an undetermined egg sac by Coquillett (1900). Auten reared *P. anchora* (Loew) from *Epeira cornuta,* and *Oscinis halterata* Mall. from the latter species, *E. sclopetaria* and *Philodromus canadensis. Siphonella oscinina* (Fall.) was reported by Coquillett (1898) from an undetermined sac, and Kintner (1935) reared a *Siphonella* sp. from *Tetragnatha* sp.

From an egg sac of *Argiope aurantia* collected at Westport, Conn. (referred to above in connection with *Megaselida*) were obtained four specimens of *Pseudogaurax anchora* (Loew). The puparia closely resemble those of *P. signata* described below, so that it is practically impossible to distinguish between them. The adults emerged between May 14 and May 21. They can be easily distinguished from those of *signata* by the color pattern on the mesonotum and scutellum (figs. 12 and 13).

---

[1] More widely known under the name of *Gaurax araneae* Coq. That this is a synonym of *signata* Loew was suggested by Becker in his 1912 Monograph on the Chloropidae. Hall (*in litt.*) confirms this synonymy.

[2] Mr. C. S. Brimley writes that he reared *P. signata* from this species at Raleigh, N. C., Apr. 13–17, 1928.

A large number of specimens of *Pseudogaurax signata* were reared by us in the laboratory, from the sacs of *L. mactans.* The original material was taken at Los Angeles, Calif. Though the usual life of adults is about two months, under conditions of a more or less constant temperature of about 23° C. and a relative humidity of about 65%, some lived over three. A constant supply of water and a cube of sugar were kept in the cage with them and occasionally a little honey and yeast mixture was given.

During the second to fifth week after emergence, the females lay from 40 to 45 eggs on the surface of the host sac. The first batch usually contains 16 to 18, with decreasing numbers thereafter. The eggs average .574 by .154 mm. They are glistening white, longitudinally ridged, and as shown in figure 5, more tapering at one end, the micropylar area. The period of incubation is 5 or 6 days. The newly hatched larva (fig. 6) is .64 mm. long, bears a pair of two-segmented short antennae, and a pair of postero-dorsal raised spiracles. Entrance into the egg-sac of the host is effected by pushing aside and crawling between the loose fibers. At times if the sac is too compactly built the larvae are unable to push through and wander about, only to die in a day or so. In contrast with the metapneustic young larva, the last instar larva is amphipneustic, a pair of 5-lobed prothoracic spiracles being present. It is also much thicker at the posterior end as seen in figure 18. These larvae are about 3.5 mm. long and shorten to about 3 mm. when changing to pupae (fig. 8). The length of larval life is 8 or 9 days, of pupal life 11 or 12. Figures 14–21 illustrate various stages in the life cycle.

An attempt was made to induce the fly to oviposit on egg sacs of a number of other species of spiders. However, although this was successful with *Theridion tepidariorum* (ten eggs were laid, of which three flies matured), a marked preference is exhibited for the sacs of *L. mactans.* In fact, this fly may well be a means of biological control of the black widow in those areas where the latter has become uncomfortably abundant in recent years. Very little equipment is needed for laboratories in the southern and western states to rear these flies in large quantities.

We are indebted to Messrs. C. W. Sabrosky, D. G. Hall, and C. H. Curran for aid of a taxonomic nature.

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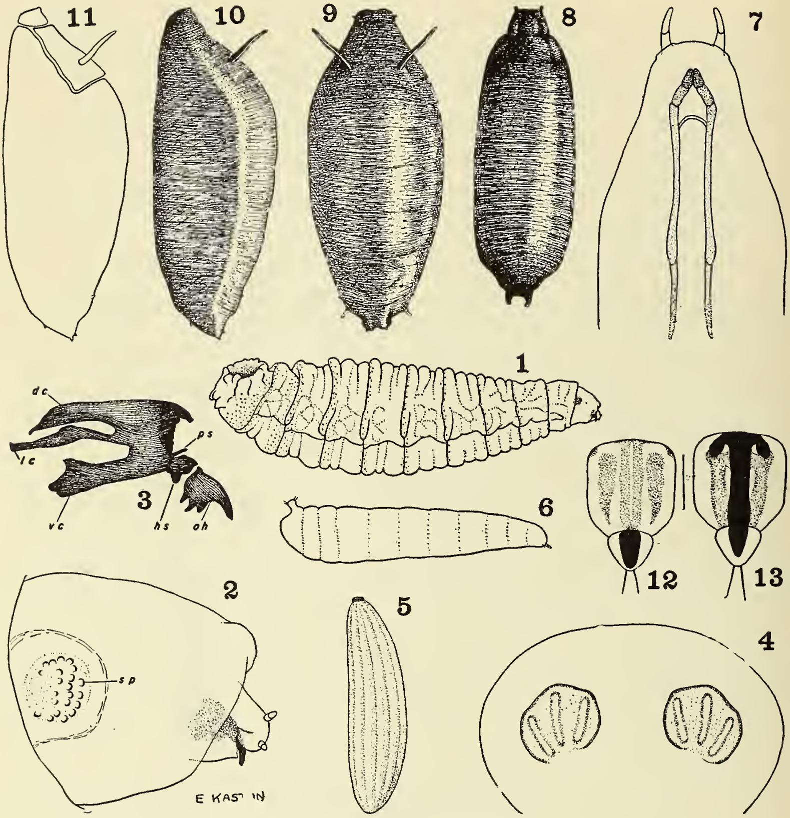
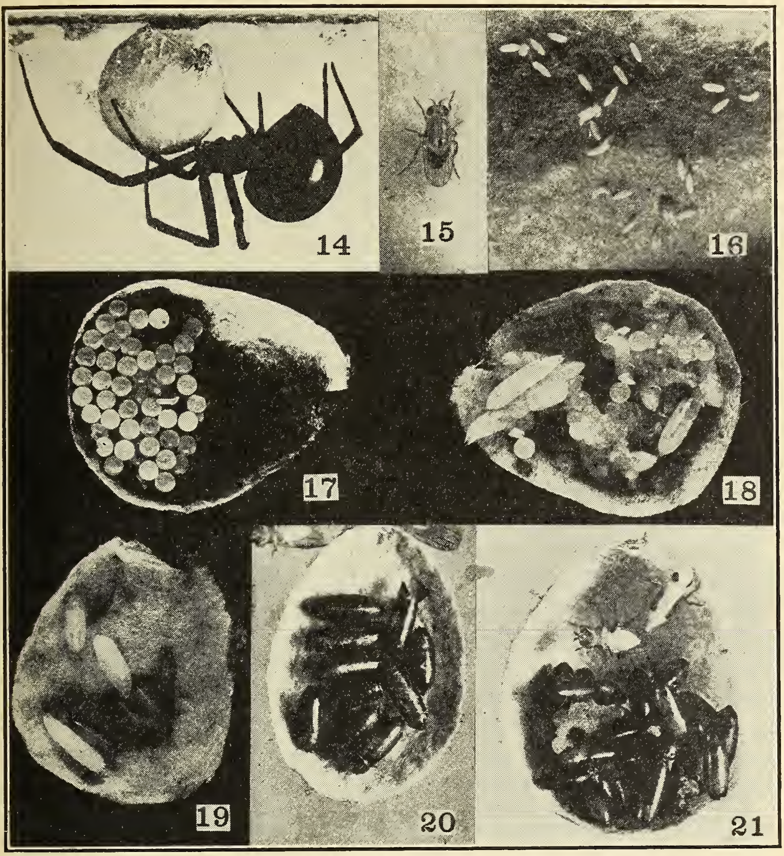
EXPLANATION OF PLATE III.

1. *Sarcophaga* sp. larva from egg sac of *Epeira cornuta.* Lateral aspect.



2. Same, prothorax and head; *sp,* spiracle.
3. Same, cephalopharyngeal skeleton; *oh,* oral hooks; *hs,* hypostomal sclerite; *ps,* parastomal sclerite; *dc,* dorsal cornu; *lc,* lateral cornu; *vc,* ventral cornu.
4. Same, posterior spiracular plates.
5. *Pseudogaurax signata,* egg.
6. Same, first instar larva, lateral aspect.
7. Same, dorsal aspect of anterior end showing antennae and cephalopharyngeal skeleton.
8. Same, puparium, dorsal aspect.
9. Puparium of *Megaselida* sp. Dorsal aspect.
10. Lateral aspect of same.
11. Same, showing where splitting occurred in emerging.
12. Mesonotum and scutellum of adult *P. signata.*
13. Mesonotum and scutellum of adult *P. anchora.*



EXPLANATION OF PLATE IV.

(All photographs by G. E. Jenks)

14. *Latrodectus mactans* with its egg sac on which can be seen a specimen of *Pseudogaurax signata* and eggs of the latter.
15. Adult *P. signata* more highly enlarged.
16. Eggs and newly hatched larvae still more highly enlarged.
17. Inside of the spider's egg sac showing a young larva among the host eggs.
18. Full grown larvae.
19. Young pupae.
20. Old pupae. Note opened puparium from which imago has emerged.
21. Note young imago with wings not yet spread, and everted ptilinum extending anterior to the eyes.

ON ARGYNNIS CORONIS W. H. EDWS. (LEPIDOPTERA-NYMPHALIDAE).

By William Hovanitz, University of California.

The systematic position of *Argynnis coronis* W. H. Edwards (1864) has been correctly interpreted by W. J. Holland (1930) and J. Gunder (1934). However, the latter's views are seemingly quite well camouflaged under the heading of a "new species" while the former's judgment was made without field experience and without adequate evidence. The present paper intends to summarize the data to date and to add convincing data pertinent to the synonomy of the species.

Dr. Herman Behr (1862) published the paper "On Californian Argynnids" in which he described several species, designating most of them by number. The next year he applied names to some but evidently omitting No. 2. W. H. Edwards (1864), with Behr's approval, named this *Arg. coronis* Behr in litt., at the same time reprinting the latter's description. Edwards, as Holland (1930) has shown, is therefore the author of the species. Some time later Strecker claims to have come in possession of Behr's types, having in his collection several specimens of *Argynnis liliana* Hy. Edwards (1876) labelled as such. On this sole and doubtful evidence, for many years thenceforth, *liliana* was considered a synonym of *coronis* while Behr's *Argynnis* No. 2 had to go without a name. Skinner (1917), following McDunnough's (1916) synonomy of *liliana,* redescribed *Arg.* No. 2 Behr as *Arg. californica,* designating as type locality Alma, Santa Clara Co., Calif., and illustrating his species by W. H. Edwards' figures of *coronis.* Comstock (1927), evidently accepting the views of McDunnough and Skinner, figures *coronis* as *californica* and *liliana* as *coronis.* Holland (1930) gives his views on *coronis* and (1931) figures correctly *coronis* W. H. Edwards but not relegating *californica* to the synonymy. Gunder (1934) correctly makes the latter a synonym of *coronis* but as his work is likely to be overlooked I give the following additional data.

Behr (1862) states that the species frequents several localities near the Bay of San Francisco. Field evidence shows that only two species occur with this range: *Arg. callippe* Bdv. (1852) and *Arg.* (No. 2) Behr (1862). Restricted to the mountains of Santa Cruz is *Arg. adiaste* W. H. Edws. (1864), and from Napa and Sonoma Cos. north is *Arg. liliana* Hy. Edws. The latter does not extend south of the barrier presented by the upper arm of the San Francisco Bay and the diminution of the inward Transition life-zone of the North Coast Range. In the few years immediately following 1860, when Behr most probably got his specimens, the country to the north of the bay was hardly opened making it extremely doubtful if Behr got them from there at all. Instead, the area near San Jose and Santa Clara was busy with mining activities (New Almaden quicksilver mines—see Brewer, 1930) and it is most probable that he collected there as well as in his "Contra Costa Coast Range" (the hills extending from Berkeley to Hayward). *Adiaste* W. H. Edws. (*Arg.* No. 7, Behr, 1862) also is found near New Almaden and was probably taken at the same time as most of Behr's *Arg.* No. 2. Furthermore, when Behr states that his specimens look like a *Euptoieta* rather than a true *Argynnis,* he is undoubtedly referring to the pointed wings of *coronis* (*californica*) and by which it stands out as distinct from *callippe* and *liliana.*

As the type localities of *coronis* and *californica* are identical and as Skinner illustrated his species with a figure of *coronis, californica* must be placed as a synonym of *coronis,* viz., *Argynnis californica* Skinner (1917) = *Arg. coronis* W. H. Edwards (1864). Also, as the significance of the term *species* in butterflies as given by earlier authors corresponds quite well to present day ideas of well defined geographic races and as *coronis* is the first name proposed in this group, it must take the specific standing. The following is tentatively arranged pending further field and morphological studies and other named forms will undoubtedly be found to belong under the same specific heading:

Argynnis coronis coronis W. H. Edwards, 1864.
Argynnis coronis snyderi Skinner, 1897.
Argynnis coronis hennei Gunder, 1934.
Argynnis coronis gunderi Comstock, 1925.

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Biological Notes on Stenomacra marginella Dallas (Heteroptera, Pyrrhocorida).—This Neotropical bug was found in great abundance near Patagonia (altitude, 4000 ft.) in Southern Arizona, on the banks of Sonoita Creek. My field notes for August 21, 1936, read: "This was on the trunks of trees, especially the cottonwoods (*Populus monilifera*) running about in all directions, some mating. Here on the bark found the red eggs of the species in clusters. A closely huddled group, which resembled a pinkish rosette on the bark, had their heads toward a common center, some even standing on others. They ran away when disturbed, to reveal that they had been feeding on the white part of a bird dropping."

On July 23 of this year, in company with Dr. Herbert Ruckes, the species was again observed in the same place, in multitudes. My notes for that day read: "They were crawling in mating pairs, about the bare earth and sand, or up and down the boles of the huge cottonwoods or on the trunks of large willows growing near the stream. Eggs also were noted, firmly attached, in clusters of some 40 to 60, to the hard rough bark of the cottonwoods or on the underside of the willow leaves; some seemingly had just hatched and others apparently were newly deposited. No bugs were found ovipositing; and there were no nymphs in any stage. The process of mating was seen. The male mounts the female in orthodox fashion and very soon connects the genitalia; he then goes off sidewise and assumes the usual end-to-end position of the pyrrhocorids. The female, being much the larger, drags the male about with her. None was observed feeding."—J. R. de la Torre-Bueno, Tucson, Ariz.

COLEOPTERA FOUND ON THE PLEUROTUS FUNGI.

By Herman Moennich, Little Neck, N. Y.

In 1935 I decided to make a survey of the beetles living in and on the following two fungi, *Pleurotus sapidus* Kalchbrenner and *Pleurotus ostreatus* Fries. The following is the list to date.

Pleurotus sapidus Kalch.

Survey of 1935

(*All taken at Alpine*)

Staphylinidae.

Philonthus blandus Grav. May 12, 1935, Alpine, N. J., 1 specimen.

Bolitobius cincticollis Say. May 12, 1935, Alpine, N. J., 2 specimens.

Atheta dentata Bnhr. May 12, 1935, Alpine, N. J., 2 specimens.

Mycetophagidae.

Mycetophagus flexuosus Say. May 12, 1935, Alpine, N. J., 2 specimens.

Mycetophagus flexuosus Say. June 1, 1935, Alpine, N. J., 1 specimen.

Mycetophagus bipustulatus Melsh. June 1, 1935, Alpine, N. J., 1 specimen.

Mycetophagus punctatus Say. June 1, 1935, Alpine, N. J., 2 specimens.

Erotylidae.

Triplax thoracica Say. May 12, 1935, Alpine, N. J., 2 specimens. June 1, 1935, Alpine, N. J., 1 specimen.

Melandryidae.

Penthe obliquata Fab. June 1, 1935, Alpine, N. J., 1 specimen.

Synstrophus repandus Horn. June 1, 1935, Alpine, N. J., 1 specimen.

Survey of 1936.

Staphylinidae.

Omalium repandum Er. May 20, 1936, Little Neck, N. Y., 7 specimens.

Stilicus dentatus Say. June 6, 1936, Little Neck, N. Y., 3 specimens.

Belonchus formosus Grav. June 6, 1936, Little Neck, N. Y., 2 specimens.

MYCETOPHAGIDAE.

Litargus tetraspilotus Les. June 16, 1936, Little Neck, N. Y., 2 specimens.

PHALACRIDAE.

Olibrus Pallipes Say. June 6, 1936, Little Neck, N. Y., 3 specimens.

TENEBRIONIDAE.

Platydema excavatum Say. June 6, 1936, Little Neck, N. Y., 1 specimen.

PLATYSTOMIDAE.

Euparius marmoreus Oliv. June 6, 1936, Little Neck, N. Y., 1 specimen.

Pleurotus ostreatus Fries.

Survey of 1935.

STAPHYLINIDAE.

Atheta frosti Bnhr. August 17, 1935, Alpine, N. J., 1 specimen.

Gyrophaena fasciata Say. August 17, 1935, Alpine, N. J., 4 specimens.

SCARABAEIDAE.

Onthophagus janus. August 17, 1935, Alpine, N. J., 4 specimens.

HISTERIDAE.

Hister unicus Csy. August 17, 1935, Alpine, N. J., 1 specimen.

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BULLETIN

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Vol. XXXII December, 1937 No. 5

SOME NEW FULGORIDAE FROM THE WESTERN UNITED STATES.

By E. D. Ball, University of Arizona, Tucson, Arizona.

Some years ago while the writer was planning a collecting trip to the Yellowstone Park he was visited by R. H. Beamer, of Kansas, and P. W. Oman, of the National Museum, and much time was spent in going over the collections and literature in *Homoptera.* At about this period, information came to the writer that a new species of *Scolops* taken in Utah had been described and named *tanneri* for its discoverer, Dr. V. M. Tanner, of the B. Y. U. at Provo. This was of much interest to the writer, as he was working on the group and he decided to visit Dr. Tanner on his trip and study the species, find out where it was collected and if possible get some material. It was probably even more interesting and intriguing because, after many years collecting in Utah, some of it in the Provo region, he had not found any new species of that genus.

The trip was made, Dr. Tanner visited. He was away working in the mountains and no one knew anything about *Scolops tanneri,* so my wife was left in the hotel and the writer started out to collect. As he was driving towards the canyon he saw a new road leading up to a high mesa on the side of Inspiration Mountain and took it, driving until it ended in a field, drove across the field, climbed through a fence and started to collect. Before going ten feet, he struck a new species of *Scolops,* larvae, and adult on a new and definite food plant, and collected a goodly set, all taken in a small patch two or three rods across. From here, he went up and down the side of the mountain and circled around for the rest of the afternoon, but found no more. The next winter, when the material of the trip was mounted and labeled, the new *Scolops* were put into the proper place in the collection and labeled *tanneri.* Then the trouble began. The writer could find no reference to such a species; he wrote to Dr. Beamer but the doctor had never heard of such a species; he wrote

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to Mr. Oman, who had never heard of it, and could find no reference; he then wrote to Dr. Tanner and asked him who had described it. The good doctor had never heard of it. Each time an answer came the writer would go and look in his collection to test whether he had been dreaming things, but *Scolops tanneri* was always there, and is there now. In order to bring it into conformity with the requirements of the code that governs unimaginative minds, the following description is appended:

Scolops tanneri Ball n. sp.

Resembling *hesperius* Uhl, slightly smaller, paler with three pairs of black spots and a strongly carinated, and almost parallel margined process, instead of an inflated and tapering. Length, ♀, 9 mm.

Cephalic process curved, strongly carinate, as long as the front, inclined to be expanded towards the apex, instead of tapering as in *hesperius*. The lateral margins mottled with brown. Two black spots on vertex, four each on pronotum and mesonotum, instead of unmarked as in *hesperius*. The venation is similar to that in *hesperius*, but the dark markings along the white veins are usually so faint as to give a pale appearance instead of the highly maculate one of *hesperius*.

Holotype ♀, allotype ♂, and fourteen paratypes taken on Inspiration Mountain, Provo, Utah, August 10, 1930, by the writer.

Scolops virescens Ball n. sp.

Form of *marginatus* Ball, nearly, the elytra broader and rounder as in *maculosus*. Pea green with big black spots on the pronotum. Length, ♀, 6–7 mm., width, 3.5 mm.

Cephalic process very slender, parallel margined from above, not half as wide as the oval vertex, very slightly if at all curved. Elytra together broadly oval as in *maculosus*, the middle sector forking well back of the first, instead of opposite as in that species.

Color: Pea green, the eyes red, the disc of the mesonotum orange; cephalic process with dark lateral and dorsal lines; vertex with a dark crescent anteriorly. Pronotum with large round black spots, faint dark dots on mesonotum and rarely black dots at apices of the elytra.

Holotype ♀, allotype ♂, and seven paratypes, July 23, 1931, and seven, July 30, 1930, all taken at Sacaton by the writer. *S. viridis,* the only other green species, is larger, more elongate, white mottled, with faint dark markings if any, while the elytral nervures fork opposite each other.

Scolops virescens var. **salsus** Ball.

Form and structure of the species but entirely salmon pink in color, except for the black markings and the lighter elytra. Holotype ♀, allotype ♂, and nine paratypes, July 23, 1931, and four paratypes, July 31, 1930, all taken at Sacaton, Arizona, by the writer.

Scolops nicholi n. sp.

Resembling *osborni* in color, shape, and primary venation, but a pygmy by comparison. Much smaller and paler than *robustus*. Length, ♂, 4–5 mm., ♀, 6 mm.; width, ♂, 2 mm., ♀, 3 mm.

Cephalic process, shorter than front, tapering uniformly with front and vertex throughout, claval nervures united at three-fourths of their length, medius with each fork forking again opposite the end of clavus. Cubitus forking before the union of the clavals, but the branches do not fork again. A row of transverse nervures in a light area some distance from apex.

Color: Pale straw, the front green, the process pale with broad lateral and narrow dorsal line black. Pronotum white with small black areas back of the eyes. Nervures pale broadly interrupted with brown, those on costa large, black, apical cells broadly smoky. Anterior femora slightly more flattened than usual, heavily irrorate with fuscous, fore and middle tibiae white with a narrow basal and a broad apical band of black.

Holotype ♂ taken September 9, 1928, in the Empire Mountains, 5,000 feet, by A. A. Nichol. Allotype ♀ and fourteen paratypes taken by O. W. Bryant in the Santa Cruz Valley on September 5, 1933. This is by far the smallest species in the group, as its closest relative *osborni* is the largest. Its size, the short black-lined cephalic process, the white collar and the fact that in *osborni* the black bands do not cross the veins will readily separate it. It might be mistaken for a small *robustus* but the tapering process and the venation remove it from that group. Named in honor of Professor A. A. Nichol whose remarkable ability to discriminate species in the field is a constant source of wonder and delight.

Phylloscelis pennatus Ball n. sp.

Resembling *pallescens* Germar, much larger, light with a white band on face and a beautiful herring-bone pattern on the numerous parallel nervures of elytra. Length, ♀, 5 mm., width, 3 mm.

Head and pronotum about as in *pallescens,* venation unique in that the claval suture is obsolete and its place taken by a nervure that forks and extends around the angle of the elytra, making about ten parallel nervures across the disc. These nervures fork irregularly but are rarely united by cross nervures until well before the apex where they may be a single fairly definite, white marked, transverse line. Fore femora foliaceous on both margins, the inner leaf gradually widening towards apex where it is little more than half as wide as the corresponding half-heart shaped expansion of *pallescens.*

Color: Gray, face and all below dark with definite white flecks, a transverse white band across the middle of face and the middle of the tibiae, usually bordered by shining black. Vertex black with a narrow transverse band, anterior half of pronotum black, remainder and mesonotum pale. Elytra creamy with a heavy herring-bone pattern omitting a few scattered areas, and a narrow line on the nervures.

Holotype ♀, allotype ♂, and seven paratypes, Comstock, Texas, August 9, 1936; six paratypes, Marathon, Texas, August 8, 1936, and one Comstock, Texas, September 1, 1936, all collected by the writer.

Orgamara argentia Ball n. sp.

Resembling *acuta* Ball, larger, much lighter colored with a broader process. Silvery gray, the lateral margins darkened. Length, ♀, 5.5 mm., width, 2.5 mm.

Cephalic process long, straight truncate, with the apex only a little deeper than wide instead of twice as deep as in *acuta.* Elytra brachypterous, reticulate, exposing five or six segments of abdomen, abdomen with two pairs of lateral white stripes. The outer pair carinate.

Color: Silvery gray, the median line almost white, the lateral margin dark with the two white stripes on abdomen distinct. Femora with marginal rows of dark dots.

Holotype ♀, allotype ♂, and thirteen paratypes taken by the writer on Joshua trees (*Yucca brevifolia*) 14 miles west of Congress Junction, Arizona, August 19, 1933.

Yucanda miniata Ball n. sp.

Smaller and much narrower bodied than *albida* Ball with a stouter less upturned process. Tawny with a pair of dark stripes on the abdomen and scarlet lacing on elytra. Length, ♀, 5 mm., width, 2 mm.

Cephalic process shorter and stouter (relative to body size) than in *albida,* deeper than wide so that the end does not approach a regular pentagon as in *albida.* Dorsal tablet narrowing to apex. Lateral tablets of pronotum, mesonotum and abdominal segments much more heavily pustulate than in *albida.*

Color: Pale tawny, the pustules lighter, the abdomen mottled, with a pair of dark stripes. Elytra with fine scarlet lacing. Legs and below scarcely marked.

Holotype ♀, allotype ♂, and four paratypes, September 17, 1932, eight, August 4, 1930, and two, August 31, 1935, all taken by the writer from a small shrub that looks like a dwarf mesquite, at the Grand Canyon Bridge, Arizona.

Yucanda ornata Ball n. sp.

Size and form of *miniata* nearly, the cephalic process much larger, the dorsal plate very broad throughout, narrowing just before apex to about twice the width in *miniata.* Gray with dark markings. Length, ♀, 6.5 mm., width, 2.5 mm.

Cephalic process very wide throughout, front definitely wider at apex than between the eyes, dorsal tablet scarcely narrowing. Hind femora slender, strongly curved.

Color: Gray powdered with white, and black marked. Process pale tawny, the pustules lighter, the dorsal tablet powdered with white. Lateral tablet of pronotum and mesonotum black anteriorly, the pustules white. Elytra very light, blackened on the basal angles and the sutural margin. Abdomen light and lightly irrorate, a pair of dark stripes on the inner third, the enclosed area dark in the females. Legs and below dark in contrast with the light tawny face, the basal portion of the slender femora pale.

Holotype ♀, allotype ♂, and seven paratypes taken by the writer on a dwarf mesquite-like shrub, on the Arizona side of the Boulder Dam, June 29, 1935.

Deserta raptorius Ball n. sp.

Resembling *bipunctata* Ball but much larger, lighter, with the cephalic process one half longer and strongly hooked. Pale gray peppered with dark on the cephalic process. Length, ♀, 6.5 mm., width, 3 mm.

Cephalic process much broader and longer than in *bipunctata,* one-half longer and nearly that much broader, as broad as its width between the eyes for three-fourths of its length, then narrowing between high carinae into a raptorial beak, the lateral compartments long and acute almost twice the length of the eye.

Color: Rather uniform pale gray with a greenish tinge, especially on the face; process heavily irrorate with dark omitting the vertex and lower part of face. Pronotum slightly irrorate, the median shield and the mesonotum usually unmarked. Elytra with the reticulations and apical portions light. Abdomen pale, rarely with traces of lines and irrorations.

Holotype ♀, allotype ♂, and 14 paratypes taken by the writer from a heavy stand of *Chrysothamnus* (Rabbit Brush) in the Tehachapi Pass, California, June 30, 1930.

Aridia nodosa Ball n. sp.

Broader and more highly ornamented than *compressa* Ball with a broader process. Pale testaceous with a dark transverse band margining the elytra anteriorly and posteriorly. Length, ♀, 4 mm., width, 2.5 mm.

Cephalic process not as long as and one-half broader than *compressa* as seen from the side with about the same inclination. The vertex one-half broader than in *compressa* and the angular portion shorter and therefore not nearly as acutely angled. Disc of vertex with two broad pits almost as in *Timonidia solitaria* Ball. Tip of projection a convex polished triangle instead of a linear depression as in *compressa.* Male genitalia showing no trace of the lateral triangle seen in the other species.

Color: Tawny with two transverse bands. Face and process tawny, the carinae broadly light with narrow dark lines. Pustules light. Pronotum light with the anterior margin darkened. Mesonotum light with the dorsal shield brown. Elytra light or tawny. The anterior and posterior margins and a "shadow" on the abdomen forming the transverse dark bands.

Holotype ♀, allotype ♂, and four paratypes, Tucson, June 19, 1933, and ten paratypes, Tucson, from May 19 to June 11, all taken from the north end of the Tucson Mountains, Arizona, by the writer.

This is the only species so far found in Arizona, and has been taken from Yuma to Tucson and north to the Grand Canyon Bridge.

Cixius clitellus Ball n. sp.

Resembling *vandykei* Van D., but with a much shorter vertex. Larger than *compta* Fowl. with a more intricate pattern in the female and a salmon colored male. Length, ♀, 6 mm., width, 2.5 mm.

Vertex twice as wide as its median length, slightly obtusely angled in front with high carinate walls. Frontal tablets with their anterior margins parallel with the vertex, quadrangular sloping to the broad front. Face in profile with a definite angle to the inflated clypeus instead of broadly rounding as in *vandykei.* Male pygofers with a broad opening and a broad short projection. The styles narrow for half their length, then broadening and making a semicircular turn which scarcely exceeds the pygofers. The dorsal membrane long, narrow, twice as long as the styles, then recurved into two short acute points.

Color: Female, dark chestnut on mesonotum and below, remainder cinnamon with three white bands on elytra, the media one the broadest, the anterior one oblique. Male, pale cinnamon brown above and below without bands, the mesonotum chestnut.

Holotype ♀, allotype ♂, and 8 paratypes, Chiricahua Mountains, Arizona, July 17, 1933, and six paratypes from the same location, July 26, 1935, all taken by the writer.

Cixius cinctus Ball n. sp.

Resembling *vandykei,* smaller, with a much narrower face, pale with heavy setigerous punctures and two dark bands in the female. Length, ♀, 5 mm., width, 2.5 mm.

Vertex twice as wide as its median length, half wider than in *vandykei,* the front less than half wider at apex than base while in *vandykei* it is twice as wide. In profile the face is more convex than in *vandykei* but much less angled than in *clitellus.* Male pygofers with a narrow notch and a triangular projection as long as wide, the plates half longer than the pygofers, separated by a long oval space, the inner angles prominent instead of rounding as in *clitellus.* The dorsal

> membrane long, narrow, with an oval expansion at apex and no teeth.
>
> *Color:* Pale tawny above and below the margins and carinae of vertex and pronotum lighter. Elytra milky subhyaline with heavy dots on the nervures, these dots with long black hairs in fresh examples. Female with a dark band just before the middle enclosing a circular light area inside costa and irregular transverse marking from the stigma back to the darker apical nervures. Sometimes two smoky areas on the clavus. Male with all markings reduced in size and intensity.

Holotype ♀, allotype ♂, and three paratypes, Tucson, September 1, 1929, and two, September 29, 1929, and two, Chiricahua Mountains, September 11, 1935, all taken in the mountains of southern Arizona by the writer.

Cixius comptus Fowler.

This species was described from two females from the Sierra Madre Mountains of Mexico (Hine) that the writer sent Canon Fowler. It has since been taken in the Santa Rita, Chiricahua, and Huachuca Mountains of southern Arizona by the writer and the male is described as follows:

> *Male:* Resembling the female in form and markings, smaller. The vertex very short and broad, three times its medium length. The face broad and evenly convex. Male pygofer opening narrow, the projection broad, rounding, the plates one-half longer than the pygofers, broad towards the apex and broadly rounding. The dorsal membrane narrow, reflexed, and the angles extending under the plates as two long spines.

Allotype ♂, August 2, 1931, and parallotype, July 29, 1935, both taken in the Huachuca Mountains of Arizona by the writer.

Cixius montanus Fowler.

This species was described, from females only, from Guerrero, Mexico. A series taken in that region last year by Ball and Stone shows that *C. flavo-brunneus* Fowler, described from males only from the same place, is the male of this species. These, like the males of *clitellus,* lack the color pattern of the females. Fowler did not show the dorsal membrane, the most distinctive character in this group. It is narrow, reflexed, and has two stout, blunt approximate projections.

Cixius cultus var. **ephratus** Ball n. var.

Size and form of *cultus,* nearly, including the long vertex and narrow elytra. Vertex and mesonotum black, the carinae reddish. Fovea of front and vertex, the lateral carinae, pronotum and tegulae broadly white in sharp contrast. Elytra milky white with a pair of black stripes outside the inner claval nervure, interrupted before the apex of clavus, another pair arising just outside the fork of the cubitus and running to the extremity of the elytra.

Holotype ♀, allotype ♂, and one paratype taken by the writer at Ephrian, Utah, June 15, 1904. This is probably a distinct species as there are differences in the head, in the breadth of the styles and in the breadth of the dorsal membrane, but as there is but the one male available it is probably best to describe it as a variety of *cultus* and hope that more material will appear.

Myndus nigrifrons Ball n. sp.

Size and form of *catalinus* Ball nearly, but the front black with a pair of oblique white lines below instead of white with oblique black lines above. Length, ♀, 4.5 mm., width, 1.5 mm.

Vertex as in *catalinus,* the front slightly narrower, the clypeus with the disc flat, the lateral margins carinated. The apex at an oblique angle instead of the disc rounding as in that species. Venation of the same pattern but the radius forking three times as far back of the stigma as in *catalinus.*

Color: Vertex and face black, the carina white, a pair of oblique white stripes from the lower margin of the front reaching almost to the center of disc. Clypeus black, pronotum white with a black "shadow" behind the head and a pair of black spots in front of the alulets. Mesonotum black in the female, tawny with light carinae in the male. Elytra white with the oblique black apical pattern of *catalinus.*

Holotype ♀, allotype ♂, and one male paratype taken on Bear grass (*Nolina*) by the writer, September 2, 1936, Alpine, Texas.

Oliarus sonoitus Ball n. sp.

Resembling *aridus* Ball, much larger, darker, with the elytra unmarked, the vertex much broader than long. Length, ♀, 10 mm., ♂, 8 mm.; width, ♀, 4 mm.

Vertex one-half or more broader than long, rather than about equal as in *aridus*. The lateral fovea broadly triangular, the face broader than in *aridus*. Elytra both long and broad, the central anteapical much longer than in *aridus*. Male styles right-angled at apex, the reflexed portion very broad, scarcely exceeding the pygofers. The dorsal membrane broad, curved, the apex truncate instead of narrowly produced as in *aridus*.

Color: Black, the carinae and margins of segments narrowly light, the broad median tablet of pronotum often tawny. Face testaceous in the female, dark brown in the male with large almost rectangular creamy spots on the sides. Elytra subhyaline, the nervures very faintly embrowned, becoming darker apically, weakly setigerous, no spots or banding even in the darkest forms.

Holotype ♀, allotype ♂, and 14 paratypes received from Dr. W. W. Jones and collected at Douglas, Arizona, July 12, 1932. This is the species the writer keyed out as *pima* Kirkaldy in his 1934 paper. A recent study of the Kirkaldy type series in the California Academy collection, however, shows that while it is mixed, the majority are what the writer described as *nogalantus* and that the greater portion of Kirkaldy's description was based on that species. It is, therefore, fixed as the type of *pima* and this species given a new designation as above.

Oliarus pygmaeus Ball n. sp.

Resembling *apache* Ball in the heavy dotting on elytra but much smaller, paler, without the setigerous bristles. Pale brown with a white collar. Elytra milky with dots and cross nervures dark. Length, ♀, 4 mm., ♂, 3.5 mm.; width, 1.5 mm.

Vertex twice longer than wide, much narrower than in *apache* with extremely long acute fovea. Face long and slender, the lateral margins of front definitely concave, then broadly expanded and suddenly contracted to the clypeus without foliaceous lateral margins and no median carinae, while in *apache* the lateral carinae of face are foliaceous throughout and the median carina continuous. Pronotum with the posterior margin definitely angular as is the submarginal carina, instead of rounding as in *apache*. Elytra with light nervures heavily and uniformly dotted, the dots inclined to be staggered on the sides of the nervures, sometimes almost opposite each other instead of in a single median row as in *apache*. Male plates resembling *apache*, much broader and flatter at the base with the reflexed ends narrower, the dorsal membrane a broad semicircular fold close to the plates rather than a tapering scoop-like process at some distance, as in *apache*.

Color: Pale, the base of vertex darker, usually a pair of dark marks running back from behind the eyes on the very light pronotum. Lateral compartments of mesonotum brown, the central tablet testaceous or lighter. Elytra milky with black dots on nervures throughout and all the cross nervures narrowly dark. Below almost black, the carinae on front light.

Holotype ♀, allotype ♂, and 14 paratypes taken by the writer at Willcox, Arizona, August 9, 1937.

Oecleus texanus Ball n. sp.

Resembling *nolina* B. & P., slightly stouter with a shorter head and a dark mesonotum with three light carinae. Length, 6 mm., width, 2.1 mm.

Vertex not projecting as far beyond eyes as in *nolina,* about as in *lineata* but the front definitely angled as seen from the side, the apex right angled, the vertex extending little more than its own width in front of the eyes. The nodal cell as in *lineata,* the stigma dark.

Color: Front and below black, the carinae and sutures white, the median carina not more than half the length of the front and broadly interrupted at the ocellus. Vertex and pronotum dark with the carinae broadly light. Mesonotum very dark, the central tablet very broad with three white carinae, the median one sometimes dilated posteriorly, a pair of oblique dashes outside this tablet. Elytra milky subhyaline, the black abdomen showing through; the nervures are pale and finely dotted, the apical ones brown.

Holotype ♀, Leverton, Texas, May 5, 1934; allotype ♂ and two paratypes, Brownfield, Texas, May 1, 1934, all taken on the dwarf yucca (*Y. glauca*) by the writer. Mr. Oman sent badly rubbed examples of this species from Texas.

Oecleus natatorius Ball n. sp.

Resembling *planus* but much larger, form of *texanus* nearly but light straw with two lines on mesonotum. Length, 6–7 mm., width, 2.5 mm.

Vertex and front meeting in a very slightly acute angle, the front in profile rounding without trace of angle. Vertex rather narrow and projecting beyond eye a little more than its width.

Face narrow, the median carina extending the full length except where interrupted by the distinct red median ocellus. The nodal cell strongly arched, but little longer than wide, the stigma unmarked or with a black dot posteriorly. One or more of the apical nervures twice forked. Male with the dorsal membrane extremely long, two or three times the length of the styles, the apex broadly rounding and canopied.

Color: Face and all below straw, occasionally a pair of dark lines on face. Above pale, the mesonotum tawny with the carinae white and occasional dark lines. Elytra pale straw, becoming slightly golden apically. The nervures concolorous, dark dots appearing on the apical half.

Holotype ♀, allotype ♂, and 14 paratypes taken by the writer on clumps of grass growing in a damp wash in Brown Canyon, Baboquivari Mountains, July 26, 1933.

Anotia caliginosa Ball n. sp.

Resembling *bonneti* but much smaller and darker. Smoky above, elytra smoky with narrow margins and central area pale. Length, 5 mm.

Head as seen from side continuing the slope of the mesonotum instead of projecting angularly above that line as in *bonneti,* then rounding over to the convex front which is much in advance of the broad clypeus. Male antennae very broad and flat, much broader than in *bonneti* and more deeply notched at the attachment of the bristle. Elytra broader at apex and shorter than in *bonneti,* with the fourth to seventh anteapical cells long, slender, and nearly parallel margined, instead of quite diverse in size and shape as in that species. Male plates long, slender, nearly parallel, margined before the long obliquely narrowing apices which entirely lack the sickle-like hooks of *bonneti.*

Color: Eyes brown, pronotum and mesonotum smoky, elytra deep smoky with the nervures concolorous. The margins of elytra narrowly creamy white, apical portion of disc subhyaline with dusky margins to the nervures. The apical and two costal nervures often narrowly scarlet with a white margin. Head and all below ivory white.

Holotype ♀, and allotype ♂ (damaged), Patagonia, Arizona, August 8, 1932. Paratype male, Nogales, Arizona, August 7, 1932.

All collected by the author. This is by far the smallest and darkest species of this fragile group.

Anotia lineata Ball n. sp.

Form of *caliginosa* slightly larger, smoky with white nervures throughout, a pale stripe on dorsum and on each elytron. Length, 6 mm.

Head as seen from side nearly as in *caliginosa* or *Amalopota fitchi.* The front more produced below and therefore more nearly vertical in profile. The vertex decidedly wider at base than in *caliginosa.* Elytra longer and narrower than in that species. The anteapical cells regular and nearly parallel margined. Male plates long and slender as in *fitchi* but broadening at the apex and transversely folded over each other, instead of narrowing and curving upwards.

Color: A creamy median stripe starting on vertex and widening to occupy half the mesonotum, then narrowing to the apex of claval areas, outside this a smoky brown or black stripe on either side arising on the apex of front and running back across the antennae, eyes, lateral tablets of pronotum and mesonotum widening on the elytra to occupy all but the costal and sutural margins and a narrow oblique ivory stripe arising on the hinge and running straight to the anterior apical angle occupying the membrane between the medius and cubitus. Elytral nervures white. Below pale yellow, the tibiae smoky.

Holotype ♀, allotype ♂, and a paratype male (with the wings broken) taken in the Santa Rita Mountains, September 1, 1929 (labeled Tucson). Three male paratypes Atascasa Mountain, August 15, 1935, and one male Huachuca Mountains, September 13, 1935, all taken by the writer in the mountains of Southern Arizona. This species resembles *Amalopota fitchi* but is smaller, lacks the red on stigma, and has a distinct color pattern and male plate.

DESCRIPTION OF A NEW SPECIES AND A NEW RACE OF CATOCALA (LEPIDOPTERA: NOCTUIDAE).

By A. E. Brower, Bar Harbor, Maine.

Some years ago when I began studying the Catocalas in the Eastern collections I found what seemed to be a new species of the *andromache* group from southern California. In 1930 when I first studied the Catocalas in the Museum of Comparative Zoology, a single specimen of this species was found which had been sent to Dr. J. McDunnough for determination. His note states that he imagined it to be a new race of *chelidonia* with better defined markings. This species is usually labeled *andromache* in collections. I have now borrowed the material in the Museum of Comparative Zoology and the United States National Museum for study. With my own specimens this makes a series of seven males and seven females. These show definite differences in maculation from any described form; and a comparison of the male genitalia with those of *andromache* from the same region, and *andromache* and *chelidonia* from Arizona shows specific differences. I name this new species in honor of Dr. J. McDunnough who has done much to put the taxonomy of this genus on a sound basis.

Catocala mcdunnoughi n. sp.

Very similar in general appearance to *chelidonia* but is larger, more yellow brown, lines heavier, and more contrasting in color. Head and thorax dark grayish, being clothed with a mixture of gray, black, and brown scales; both patagia and tegulae seem to lack any defined markings. Abdomen yellowish brown like its close relatives. Forewings rather smooth grayish brown, shaded with fuscous, lines black; basal half-line narrow, angulate, transverse; transverse anterior line geminate, inwardly pale, outwardly black, rather regularly oblique, angled outward on radius and black filled above angle, strongly bowed inward on the fold; transverse posterior line prominent and angulate, with large teeth well developed and pointed, the upper longest, thence rather regularly oblique to inner margin with inward bend below fold; transverse posterior line paler edged outwardly along upper portion and near inner margin; darker brown band beyond transverse posterior line, followed by pale shade; median shade strongest on costa, diffuse dark area beyond reniform and subreniform; reniform poorly defined, elongate to quadrangular, outlined with paler line; subreniform irregularly rounded, outlined with a narrow dark line and contrastingly lighter than ground color; terminal dark marks small and rounded. Secondaries like *chelidonia,* with anal spot separated from marginal band, but median band averages heavier and more strongly hooked. Under side of primaries fuscous basally, and with median and broad marginal black bands setting off yellow bands. Under side of secondaries like upper side. Expanse: Holotype male, 47 mm.; allotype female, 53 mm.; average of types, 47 mm.

Type locality: Southwestern California.

Types: Holotype male, Mount Wilson, California, July 30, 1917; allotype female, Mt. Lowe, California, August 21, 1923; paratypes: Los Angeles County, California, one male; Mt. Lowe, California, male and female, August 21, 1923; Mt. Wilson, California, three males and five females, July 30 to August 4; and Garces, Arizona (this is a dealer's label and very probably incorrect), one male. Holotype male in Museum of Comparative Zoology, allotype female in United States National Museum, paratypes in these and the author's collection.

Catocala mcdunnoughi differs from *chelidonia* in being larger in size, more contrasting in markings, with somewhat more prominent teeth on t. p. line, which is more evenly oblique from large teeth to inner margin, being less strongly bowed outwardly on the fold than on *chelidonia.* The genitalia are distinct.

Catocala andromache race **benjamini** new race.

The presence of two races of *andromache* was pointed out to me by the late F. H. Benjamin. The problem has been to determine to which of these Henry Edward's worn type belongs. The type is a female despite his statement in the original description that it is a male. *Andromache* from southwestern California is grayish yellow more or less tinged with fuscous, always with a rather prominent overlying covering of yellowish green scales. *Andromache* from Arizona is slightly larger and darker in color with far less of the yellowish green scaling, which makes the two races readily separable by the difference in appearance. A careful comparison of representatives of both races with the type shows that typical *andromache* belongs to the greenish scaled race from the coast ranges of mountains in southwestern California. The darker, browner race from southern Arizona is unnamed and I propose for it the name *benjamini* new race.

Expanse: Holotype male, 47 mm.; allotype female, 49 mm.

Type locality: Mohave County, Arizona.

Types: Holotype male, Mohave County, Arizona, July 8–14; allotype female, Mohave County, Arizona, June 8–15; paratypes, sixty-eight males and forty-two females from the following Arizona localities: Mohave County, Hualápai Mts., Southern Arizona, Redington, Gila County, Huachuca Mts., Pinal Mts., Santa Catalina Mts., Arizona, unlabeled, and one pair, Kerrville, Texas (a dealer's label, probably incorrect). All were collected from May 15–22 to late July, mostly by Otto Poling. Holotype and allotype in United States National Museum, also most of paratypes; the other paratypes in author's collection and Museum of Comparative Zoology.

The Nest and Prey of *Chlorion (Ammobia) caliginosum* in Colombia (Hym., Sphegidae; Orthoptera).—During a month's stay, last summer (1936), at the town of Muzo, Dept. Boyacá, Colombia, I had occasion to visit the venerable, but now much dilapidated church. There was as much life inside as in the adjoining yard and garden, insects passing to and fro through the open doorways and paneless windows. Various social wasps and muddaubers were nesting on the rafters and walls; but my attention was especially attracted by the buzzing of some very large fossorial wasps, *Chlorion* (*Ammobia*) *caliginosum* (Erichson), as determined by Dr. Richard Dow. A thriving colony had dug several deep burrows beneath the flagstone floor, opening through the adobe that held the stones together. Some of the females were dragging in, as prey, immature long-horned grasshoppers or katydids. One of the largest specimens taken from a wasp is, according to Mr. James A. G. Rehn, *Cocconotus atrifrons* (Brunner).—J. BEQUAERT, Museum of Comparative Zoölogy, Cambridge, Mass.

ARIZONA INSECT LOCALITIES.

By J. R. de la Torre-Bueno, Tucson, Ariz.

"Ariz." on an insect label means nothing; "Sta. Ritas" means but slightly more than nothing.

Since coming here three years ago, I have become more and more aware of this. Eastern collectors in general have little idea of the general and special conditions of this great State. From the high Kaibab Plateau in the North central part of the State and the moisture laden Salt River Valley to the low depression and shifting sands of Yuma, from the arid plains about Tucson to the fir-clad heights of Mount Lemmon, there is a constant variation in vegetation and other ecological conditions. All this affects the insect fauna. Much of what is found in the sheltered, more humid and cooler canyons is absent from the arid plains and uplands. The oaks, spruce and sycamore of the higher canyons are replaced in the plains by Opuntias and many other cacti, creosote bush, mesquite and the many gray-colored desert annuals. Not, of course, that there is any clear-cut line of demarkation—nature is not a layer cake—between the plants and insects of the plains and of the mountains; but that here, as everywhere, there are to be found at times pure cultures of plant and animal associations, mutually interrelated. Needless to say, these statements are not absolute, since many plant and insect forms are practically universally distributed within climatic ranges, while others, as is well known, follow the soil that grows the plant that feeds them.

It follows from these remarks that an Arizona insect locality label is practically valueless without data, at least of altitude, and certainly somewhere there ought to be an indication of the food-plant. But this is about all that can be expected on insects received from the regular commercial collectors. Students of insect biology naturally furnish more data, but not too many miscellaneous insects—they haven't the time to spare. This list of localities is presented to inform collectors distant from this State at least as to the position, altitude and exposure of localities of insects from the older collectors in Arizona; and where possible, to give the general nature of the soil and of the vegetation or the general biotic environment. Places are arranged alphabetically—not geographically—for ready reference. When known, the name of the collector in a particular region or locality is given.

My thanks for the biotic data are given to Professor A. A. Nichol of the Department of Range Ecology of the University of Arizona.

His great experience all over the State in studying plant and animal life makes his contribution authoritative. Place names and locations are derived mostly from Will C. Barnes' work on "Arizona Place Names," published by the University of Arizona. Altitudes and compass directions are from the topographic map of the State put out by the University in conjunction with the U. S. Geological Survey; these altitudes are necessarily not exact to the foot, but approximations arrived at from contour lines.

ARIVAIPA—A post-office and ranch near San Carlos Lake, in Graham County, in the southeastern part of the State; altitude about 4600 ft.

BABOQUIVARI MOUNTAINS—This range extends from the Mexican border north to Quinlan Mountain (sometimes the node in which this peak lies is called Quinlan *Mountains*). It is sometimes called in the older maps "Pozo Verde Mountains" (Green Well Mountains). The range lies on the East side of the Altar Valley, entirely in Pima County, in the south central part of the State. These mountains very sharply divide the Upper from the Lower Sonoran Zone. Most of the early collecting was done on the East side of the range, in the canyons. In the latter, the vegetation is the thorn-bush association—mimosas, mesquite (*Prosopis*), *Alyssum, Celtis* and cacti; the foothills are of the savannah type—grama and curly mesquite grasses.

BABOQUIVARI PEAK—The highest elevation rises to 8500 ft., and is situated about the middle of the range. The vegetation is the same as that of the rest of the range.

BEAR CANYON—In the southwest slope of the Santa Catalina Mountains. It runs N. E. and S. W., rising from about 3000 ft. at its entrance to 4300 ft. at the top. Characteristic plants are honeysuckle (*Lonicera*) and *Encelia farinosa* (tarweed or resin plant). This is a favorite place for collectors out of Tucson, about 15 miles from that city. Dr. James G. Needham, Dr. E. D. Ball, Dr. L. P. Wehrle, G. P. Engelhardt, Owen Bryant, J. R. de la Torre-Bueno and many others have collected here.

BENSON—A town about 48 miles east of Tucson, in the San Pedro Valley, in Cochise County; altitude 4300 feet. Vegetation is of the mesquite-catclaw type, with wild honeysuckle (*Lonicera*).

BILL WILLIAMS RIVER—A stream formed by the junction of the Big Sandy and Santa María Rivers, flowing west into the Colorado River. At Planet, some 10 miles from its junction with the Colorado, elevation about 300 feet, it is hot, with wet land vegetation; away from the river the vegetation is of the sparse Colorado-proper type; mostly *Plantago, Euphorbiae* (spurges), *Poinsettia, Lycium, Atriplex* and other salt bushes; *Parosela* (the smoke-tree) which blooms in June. The rainfall is probably not over three inches per year. Cacti are few—it is too dry.

BILL WILLIAMS FORK—This lies about 50 miles up the river from its junction with the Colorado; the elevation ranges from 1300 to 1500 ft. and there is more rainfall. Characteristic vegetation is arrowweed, thornbushes, mesquite, palo verde, Yuccae and other Lilliaceae with not much cactus. Dr. F. H. Snow collected hereabout, on the boundary line between Mohave and Yuma Counties; he gives the elevation as 1000 ft.

BILL WILLIAMS MOUNTAIN—A peak southwest of the town of Williams, in Coconino County. It rises to 9000 ft. from a high base level at 6000 to 7000 ft. The vegetation is yellow pine, running to aspen, spruce and fir—the Northern Michigan Association.

BISBEE—This mining town lies 6 miles north of the Mexican boundary in the Mule Mountains, at an altitude of 5500 ft. There is much cactus and *Agave* together with the usual grasses of the region; the trees are mainly oak, piñon pine and juniper.

BRADSHAW MOUNTAINS—A range in Yavapai County, south of Prescott; the altitude runs between 3300 and 6900 ft. H. G. Barber has collected here.

BRIGHT ANGEL CREEK—This stream rises in the Kaibab Plateau, at about 8000 ft. altitude and falls rapidly to the Colorado River, cutting in its descent many life-zones and plant associations.

BONITA—A locality in Post Creek Canyon, in the Graham Mountains, which see. It is in Graham County, 5 miles west of Fort Grant.

CARR CANYON—In the Huachuca Mountains, which see, elevation about 6000 ft. H. G. Barber and Charles Schaeffer collected here.

CASA GRANDE RUINS—This prehistoric Indian ruin in one of the National Monuments, about 65 miles northwest of Tucson, at an elevation of some 1500 ft., in a flat country of salt bush and creosote bush association. The writer has collected here.

CATALINA MOUNTAINS—See Santa Catalina Mountains.

CATALINA SPRINGS—This is a locality given by H. G. Barber, but not shown on the standard map.

CHIRICAHUA MOUNTAINS—This range lies in the southeast corner of Arizona, near the Mexican Border and runs more or less North and South; altitude from 4900 to 7500 ft. This is a favorite hunting ground of Dr. E. D. Ball.

Cochise County—The extreme southeast county of Arizona; the Chiricahua Mountains lie in it. Sundry records from this section came on insects from the late George Franck; the actual collector is so far unknown.

Congress Junction—In Yavapai County, on the Phoenix-Ashfork railway line, altitude some 3000 ft.; also called Martinez. Dr. F. H. Snow collected here.

Continental—In Pima County; a station on a branch line out of Tucson, about 25 miles in a southeasterly direction; turning point for the Santa Rita Mountains. The general growth is catsclaw, mesquite, cactus, etc.; rainfall about 15 inches per annum. This is the site of a rubber-planting scheme, the irrigated areas of which have made some change in the vegetation. The crop now grown here is cotton.

Coyote Mountains—The north end of the Baboquivari Range, with the same general vegetation. Altitudes range from 2300 to 4600 ft. J. R. de la Torre-Bueno has collected there.

Douglas—A mining town in Cochise County, on the Mexican border; altitude 4500 ft. The vegetation is sacaton and grama grasses; the hills roundabout have the usual vegetation of the altitude. This is another of Dr. Snow's collecting grounds.

Fort Grant—This is an H. G. Barber locality, at the western foot of the Pinaleño Mountains (locally termed Graham Mountains), in Graham County; altitude about 4900 feet.

Flagstaff—In Coconino County, in the middle of the northern part of the State; altitude up to 7700 ft.; yellow pine association—bunch grass, Gambel oak, etc.

Florida Canyon—See Santa Rita Mountains.

Graham Mountains—Another name for the Pinaleño Mountains; in Graham County; rise from 4900 ft. to Graham Peak, 10,200 ft. elevation. Low desert to spruce and aspen, according to altitude. Owen Bryant and the writer have collected here.

Galiuro Mountains—In Pinal and Graham Counties; the range runs southeast from Arivaipa Creek to the Graham-Cochise County line; altitude 3000 to 6000 ft. H. G. Barber has collected here.

Globe—In the Pinal Mountains, in Gila County, about 100 miles east of Phoenix. The collecting ground of Owen Bryant, D. K. Duncan and Frank Parker; 3600 feet elevation.

Higley—In Maricopa County, 12 miles southeast of Mesa; altitude 1300 ft. E. G. Holt collected here.

Hot Springs—In Yavapai County; also called Castle Creek Hot Springs; altitude 3000 ft. Collected by Dr. E. A. Schwarz.

KAIBAB NATIONAL FOREST—In Coconino County, in the north central part of the State near the Utah border. The general altitude is 7000 ft. Douglas fir, yellow pine, spruce and aspen are the prevailing trees. Dr. E. D. Ball has collected here. The name in the Pi-ute language means "mountain lying down." Included in this area is the Kaibab Plateau.

MOUNT LEMMON—The highest peak of the Santa Catalina Mountains, rising to a height of 9180 ft. at the summit. It lies in Pima County, on the northeast side of the range. The Douglas fir association is the prevailing type of vegetation. Note the spelling of the name—it has nothing to do with any citrus fruit, since it is the surname of Prof. J. G. Lemmon, who named it in honor of his wife. This collecting ground is frequented by the Tucson entomologists—Dr. E. D. Ball, Owen Bryant, J. R. de la Torre-Bueno and others.

MCCLEARY PEAK—In Pima County, in the Santa Rita Mountains; elevation 7000 ft.

MCCLEARY'S CAMP—In the Santa Rita Range Reserve, in Florida Canyon (once known also as Stone Cabin Canyon), in Pima County. Dr. E. A. Schwarz collected here, as well as elsewhere in the Santa Ritas, which see for biotic details.

MADERO CANYON—Also known (more commonly) as White House Canyon, and originally by the Spanish name "Casa Blanca," which means the same; in the Santa Rita Mountains in Santa Cruz County. Elevations range from 4900 to 6600 ft. Collected by Bryant, Ball, Nichol, Parker, Bueno, G. P. Engelhardt. For the prevailing vegetation see Santa Rita Mountains.

MARTINEZ JUNCTION—The same as Congress Junction, which see.

NOGALES (Arizona)—The town on the American side of the international boundary, separated by a wire fence from Nogales, Sonora, Mexico. The American town is in Santa Cruz County. The elevation is from 1500 to 4000 ft. in the surrounding hills. The vegetation type is the live-oak—grass savannah. Frequented by many entomologists, as it is the point of entry into Mexico.

OAK CREEK CANYON—Dr. F. H. Snow and Mr. G. P. Engelhardt have collected here.

ORACLE—A town in Pinal County, on the northern end of the Santa Catalina Mountains. Altitude about 3700 ft. Flora and collectors as for Santa Catalina Mountains, with Dr. H. H. Knight added.

PALMERLEE—Cochise County; in the Huachuca Mountains, at about 6500 ft. Dr. F. H. Snow records from here.

PATAGONIA—In Santa Cruz County; a town on Sonoita Creek, at the northern end of the Patagonia Mountains; about 20 miles northeast of Nogales and less than that from the Mexican border; a section of grassy rolling hills with oaks, and cottonwoods along the creek; altitude amout 3900 ft. Has been collected by the Tucson entomologists—Ball, Bueno and others—and by Dr. H. F. Ruckes and Mr. G. P. Engelhardt.

PHOENIX—Capital of the State, in Maricopa County, in the Salt River Valley. This is irrigated farm land and owing to the many canals and ditches, rather humid. The vegetation is altered to the water-needing forms and ordinary farm weeds. The altitude is about 1300 ft. The late Dr. R. E. Kunze collected here commercially, and as he ranged all over the valley, his "Phoenix" locality means anything within 20 miles of that City. The official entomological service of the State centers here.

PICACHO LAKE (or Reservoir)—In Pinal County, about 45 miles N.W. of Tucson; a large but shallow lake at the northern end of the Picacho Mountains, a storage reservoir in the Casa Grande irrigation system. Rather barren of aquatic forms, however. The surrounding vegetation is the usual wet land association; altitude 1700 ft. Collected by the Tucson people.

PINACATE RANGE (or lava flow)—This mountain range lies in the extreme southeast corner of Yuma County and runs over into Mexico where it culminates in a high system. The altitude is about 1000 ft. Ball collects here. This is a true Lower Sonoran Zone; the vegetation is sparse—cacti, a few legumes and annuals. The rainfall is very low; the climate consequently dry and hot.

PINAL MOUNTAINS—In Gila County, southwest of Globe, which see. Frank Parker and Owen Bryant have collected here. Altitudes range from 5000 to 7850 ft. at Pinal Peak.

PRESCOTT—County seat of Yavapai County; the country roundabout Fort Whipple (just outside of the town) is the piñon pine, juniper, yellow pine association; altitude about 5500 ft.

QUARTZSITE—Yuma County; elevation 900 ft. The late George Franck had a collector here, name not known to me. Franck's labels read "Quartzs*id*e." See Yuma for further particulars.

RINCON MOUNTAINS—Pima County; lie about 15 miles east of Tucson, rising from the Rincon Valley, elevation 6500 to a height of 8500 ft. at Rincon Peak.

SABINO CANYON—Runs northeast into the Santa Catalina Mountains, which see. Varies from 3400 ft. elevation up. The prevailing vegetation is desert shrubs, Opuntias, etc., with a few Western sycamores along the stream. Everybody collects here at all seasons.

SALT RIVER—See Phoenix.

SAN BERNARDINO RANCH—In Cochise County; 18 miles east of Douglas on the Mexican border; elevation 3750 ft. See Douglas for prevailing vegetation. Dr. F. H. Snow and H. G. Barber have collected here at various times.

SANTA CATALINA MOUNTAINS—In Pima County, northeast of Tucson. Typical desert, within an easy ride to the southwest slope, but very roundabout to the northeast. It rises from about 2500 feet at the foothills to the highest peak, Mount Lemmon, which see. Plants in the foothills, white cedar, Douglas fir, oaks, etc., at the higher levels. Everybody collects here.

SANTA RITA MOUNTAINS—This range lies in Santa Cruz and Pima Counties, northeast of Nogales; elevations range from about 4600 to 9400 ft. at the top of Mount Wrightson, the highest peak. The vegetation is that typical of the other near-by mountains. White House (or Madera) Canyon and Florida Canyon lie in this range. The greater part of the collecting has been done in the canyons by Prof. A. A. Nichol, Dr. E. A. Schwartz (see McCleary's Ranch), Frank Parker, Owen Bryant, G. P. Engelhardt, Dr. E. D. Ball, J. R. de la Torre-Bueno and many others. This is the type locality for numerous new species.

SANTA RITA RANGE RESERVE—Fifty thousand acres of grass savannah, mesquite, etc., going into the tree associations in Florida Canyon, which forms part of it; elevation from 3000 to 5500 feet.

SONOITA CREEK—See Patagonia.

SUMMER HAVEN—A summer resort on the east side of Mount Lemmon, which see; elevation, some 7800 ft.

TANQUE VERDE MOUNTAINS—The south end of the Catalinas, in Pima County, 20 miles east of Tucson; the general altitudes and vegetation the same. All Tucson entomologists and some visitors have collected here.

TEMPE—In Maricopa County, 9 miles east of Phoenix, which see.

TINAJAS ALTAS—In Yuma County, close to the Mexican border, in long. 114° W.; altitude 1000 to 1700 feet; Dr. Ball collects here.

TUCSON—The City of that name, in Pima County; bench mark altitude 2400 ft., going higher as one mounts the foothills. As a locality, it means practically all the country within 10 miles of the city. The vegetation is typical of the arid country—mesquite, palo verde, creosote bush, cacti and numerous composites. The conditions are quite uniform, except where there is irrigation, where one finds numerous intrusive plants suited to the moisture of the ground. *All* collectors have a Tucson label, and should state the altitude.

TUCSON MOUNTAINS—In Pima County, some 5 miles west of the city; typical mountain and foothill plants.

TUMACACORI MISSION—In Santa Cruz County, on the Nogales road. G. P. Engelhardt and J. R. de la Torre-Bueno have collected here.

WHITE HOUSE CANYON—The same as Madera Canyon, which see.

WILLIAMS—See Bill Williams; W. D. Pierce labels bear this locality.

WRIGHTSON (MOUNT)—Old Baldy; highest peak of the Santa Ritas, which see.

YUMA—In Yuma County; the town proper is about 200 ft. elevation; but the lowest parts of the surrounding desert are near sea-level. A. E. Morrill collected here; also G. P. Engelhardt. Some of this section is a true desert, with shifting wind-blown sands, no rain and temperatures reaching maxima of over 120° F.

Much could be added to this, many other places and collectors cited. It is very desirable that those who know additional facts should inform the writer, for a supplement to be published later.

Dr. Geza de Horváth.—We learn with deep regret, by a notice from the Hungarian National Museum, of the death of Dr. Horváth at the age of 90 years. He was the last survivor of the great era in hemipterology that gave us Stål, Fieber, Puton, Signoret, our own Uhler and many other eminent workers. Dr. Horváth's work was always remarkable for clarity and grasp of the problem. His death has taken from us one who was easily the greatest of hemipterists in this generation, for in spite of his great age, he was productive of important work to the very last. Entomology has lost in him one of its great men, and the last link with the almost legendary past.—J. R. T.-B.

TWO APPARENTLY UNDESCRIBED MEALYBUGS (HEMIPTERA: PSEUDOCOCCIDAE) FROM NEW YORK STATE.

By George J. Rau, West New York, N. J.

Pseudococcus cuspidatae n. sp.

Described from numerous specimens selected from a series of many.

Holotype and two paratypes on one slide deposited in the National Collection.

One mounted and many unmounted paratypes deposited in the Stanford University Collection.

Numerous other paratypes in my own collection.

Adult Female: In Life:—Margin of body with distinct waxy filaments; filaments on caudal end scarcely half the length of the body. Wax unevenly distributed over the dorsum, so as to give the appearance of four longitudinal lines through which the body fluid appears to be red. Upon irritation the posterior dorsal ostioles secrete an orange fluid which hardens with time. Body fluid dark red. Specimens treated with 10% KOH turn dark red. Either no or an undeveloped ovisac is formed. Young brought forth alive.

Morphological Characters:—Holotype, length, 4 mm., width, 2½ mm. (Differences in sizes of seven individuals, length, 3½–4 mm., width, 2–2½ mm.). Uniformly oval with flattened sides. Antennae normally eight segmented, each segment with the following lengths: 1, 43 μ; 2, 94.6 μ; 3, 82.6–86 μ; 4, 51.6–56 μ; 5, 68.8 μ; 6, 43–51.6 μ; 7, 43 μ; 8, 94.6 μ. (The differences in the lengths of the segments of seven specimens are: 1, 43.6–55 μ; 2, 75.7–96.3 μ; 3, 72.2–87.2 μ; 4, 41.3–58.5 μ; 5, 51.6–68.8 μ; 6, 41.3–56.8 μ; 7, 41.3–44.7 μ; 8, 94.6–103.2 μ.) With seventeen pairs of cerarii containing the following number of spines. 1, 4; 2, 5; 3, 5; 4, ?; 5, 4; 6, 3?–5; 7, 2?–4; 8, 3–4; 9, 3; 10, 3; 11, 2–3; 12, 3–4; 13, 3–4; 14, 3–5; 15, 4; 16, 4–5; 17, 2. (Number of spines in seven specimens: 1, 2–6; 2, 4–7; 3, 3–5; 4, 3?–5; 5, 3–5; 6, 3?–6; 7, 2?–4; 8, 3–4; 9, 3–4; 10, 3–4; 11, 2?–4; 12, 3–5; 13, 3–5; 14, 3–6; 15, 3–6; 16, 3–5; 17, 2–one individual in one anal lobe cerarius has five spines.) Spines of anal lobe cerarii large, gradually decreasing in size toward the anterior part of the body. Anal lobe cerarii surrounded by large chitinized areas containing a pair of spines, numerous trilocular disc pores and from 9–15 auxiliary setae of varying sizes and a large seta about 200 μ long, near the posterior end of the anal lobe; a ventral chitinized bar extends cephalad from the posterior end of the dorsal chitinized area bearing a secondary seta about 160 μ long at the posterior end of the anal lobe. Anal ring on dorsal side with six setae each about 160 μ long. In each of the ceroris of the lateral orbacerores of the anal ring a very slender seta projects from about the center and about two-thirds the length of the ceroris. Multilocular disc pores sparse (not over thirty) confined to the ventral side of the last three abdominal segments. Trilocular disc pores well distributed over the body both dorsally and ventrally. Small tubular ducts not numerous, confined to the region around the cerari or in small numbers following the segmentation of the ventral posterior part of the body. Dorsal body setae small and scattered over the body. Ventral body setae much longer and relatively more slender, quite conspicuously arranged in irregular order at the anterior end but posteriorly usually following the segmentation of the body. Circulus quadrate, rounded at the top and bottom and depressed on the sides. Ventriculus quadrate.

Immature Stages: The first and third larval stage can be distinguished from other local species by the chitinized oval areas on the dorsal side which extend to chitinized bars on the ventral side. The antennae of the first larval stage is six segmented while that of the third larval stage is seven segmented. In both cases no multilocular pores are present. Second larval stage not seen.

Adult Male:—Bred the male in large numbers during the first generation of 1936. Males present few features that are of use in separating the species, which, together with the difficulty of procuring specimens make them of little value for taxonomic purposes.

Type Locality:—East Rutherford, New Jersey, on *Taxus brevifolia,* June 20 and July 1, 1936, and during the early part of June, 1937.

Distribution:—There is one slide of this species in the National Collection with the following information—July, 1915, Mr. H. B. Weiss, Nursery in East Rutherford, New Jersey, on *Taxus cuspidata* brought in from Japan. This is the species which was tentatively identified as *Pseudococcus krauhniae* Kuw., another species from which the new species can easily be separated and which might be present in the greenhouses of the New York Botanical Gardens. The new species has been recorded under the above name in the following publications: *Journal Economic Entomology* 8, No. 6, 1915, p. 551; 9, No. 1, 1916, p. 214; *Entomological News* 27, 1916, p. 163.

Prof. G. F. Ferris writes to me that this insect is the same as a species which he received from Ithaca, New York. Dr. S. W. Bromley sent me material of this species from *Taxus* sp. from a private estate at Stamford, Connecticut, on June 12, 1936. Dr. W. E. Britton sent me specimens of this species collected by J. P. Johnson during early June, 1937. I found this species present on the Skidmore College grounds, Saratoga Springs, New York, both in 1936 and 1937, and at Larchmont, N. Y., late June, 1937.

This insect is found in great numbers on *Taxus brevifolia* in the nursery at East Rutherford, N. J. It also occurs on apple, basswood, cedar, maple and rhododendron in the adult state and I think only for oviposition. I have been unable to find any specimens on pines. No doubt this mealybug will be found generally distributed over the northeastern part of the United States since the host plants have been widely distributed by the large nurseries. It has potentialities of becoming a pest on *Taxus* sp.

Separation from other species: In life this species looks very similar to *Phenacoccus gossypii* T. & Ckll. and *Pseudococcus gahani* Green but does not form the well developed ovisacs which the above two form. *Pseudococcus cuspidatae* is viviparous while the other two are oviparous.

Pseudococcus comstocki Kuw. also occurs quite commonly on *Taxus* sp., and morphologically is somewhat similar to *Pseudococcus cuspidatae*. It is separated from the other species by the following characters:

1. It has the small ringed tubular ducts which are not present in the other.
2. The small tubular ducts occur in large numbers about the cerarii, while in the other species they are sparse in the same regions.
3. The multiocular pores occur in large numbers (over 50) on the last three ventral abdominal segments, in the other they are less numerous (under 30).
4. In *Pseudococcus comstocki* there are 3–4 spines in each of the 1st to 7th pair of cerarii and 2 spines in all the other cerarii, while in *Pseudococcus cuspidatae* there are more than 2 spines in all except the last pair of cerarii in which there are 2 spines present in each cerarius. There is a tendency for this number to vary from 3–7 in all the cerarii except the last pair.

5. It has a triangular chitinized area on the ventral side while in the other it is an elongate chitinized bar.

In life *Pseudococcus comstocki* is separated from *Pseudococcus cuspidatae* as follows:

1. It produces a well-developed ovisac, the other produces either an undeveloped or no ovisac.
2. It is oviparous not viviparous.
3. On the dorsal side the wax is distributed evenly over the body in the first while in the other there are four longitudinal rows of dark impressed lines in which there are no waxy secretions.
4. The body fluid is brown, that of the other is dark red.

Life History:—Winter is passed in the first stage in the crevices of the bark or beneath the waxy secretions left by the adults of the preceding year. During the first warm days in the third week of March, 1936, the larvae became active and migrate to the smaller branches of the host to feed. Males were present in large numbers May 18 and 19, 1936, when the third larval stage was present. The young of the second generation were first observed about the beginning of July. Discontinued observations at East Rutherford the beginning of July. Found the same species present at Saratoga Springs August 17 when both adults and larvae were present. About the beginning of September the adults gradually disappeared. When preparing to reproduce the adults migrate to the thicker limbs and forks of the host plant. There are presumably two and one-half generations a year around the area of East Rutherford, New Jersey.

Phenacoccus saratogensis n. sp.

Described from four mounted slides.

Holotype deposited in the Stanford University Collection.

Paratypes, mounted and unmounted, in my own collection.

Adult Female: In Life:—Body covered with waxy secretion. Margin of body with four subquadrate lateral waxy plates on each side, one cephalic and two caudal waxy filaments. Dorsum with three waxy plates in median line. Color in 10% KOH brown. Eggs laid in well developed ovisac. Insects occur on underside of leaves of Bottle Brush Grass—*Hystrix patula* Moench. Collected Sept. 9, 1936, and July 4 and 5, 1937, at Saratoga Springs, New York.

Morphological Characters:—Holotype, length 1½ mm. width ¾ mm. (Differences in sizes of four individuals, length 1½–3 mm., width ¾–1½ mm.) The holotype is about half the size of the paratypes, being designated so, since it is the best mounted slide. Elongate oval. Antennae normally nine segmented, each segment with the following lengths: 1, 44 μ; 2, 64 μ; 3, 52 μ; 4, 36 μ; 5, 44 μ; 6, 36 μ; 7, 34 μ; 8, 38 μ; 9, 70 μ. There does not appear to be any proportional differences in the lengths of the antennal segments and the sizes of the insects. Legs normal, claw of tarsi with a tooth on the inner margin and a pair of setae without digits. With eighteen pairs of cerarii on slightly raised tubercles near the margins of the dorsal sides. Each cerarius with two or three slender spines and several trilocular disc pores, no setae present. Anal lobe cerarii with 3–4 spines of average lengths of 13.3 μ. Ventral side of anal lobe with two long and three short setae, the two longer setae averaging in length 200 μ and 100 μ respectively. Anal ring on ventral side proximal to the ventriculus. Anal ring lacking the lateral orbaceroris region but surrounded by numerous minute tubercles, with six setae, each 136 μ long. Multilocular pores abundant both dorsally and ventrally, of two sizes, those in transverse bands following the segmentation of the body in the last three abdominal segments on the ventral side average 6.5 μ in diameter. The others average 8 μ in diameter and are arranged in conspicuous circular groups of 3–7 pores in the abdominal region and 3–4 pores in the head and thoracic regions. Circular groups of multilocular pores arranged in irregular fashion about the head marginal regions of both sides. In addition, twelve transverse rows, each containing 14–26 circular groups of pores following the segmentation of the body occur on the dorsal side while two transverse rows of circular pores, occurring in much the same fashion as the above, are found on the ventral side, the immediate region between the antennae and the third pair of legs lacking the multilocular pores. Quinquelocular pores fairly numerous on ventral side, especially in the regions where the coxae are attached to the body, but lacking in the last three abdominal segments. Trilocular pores abundantly distributed over the body, especially on the dorsal side. Tubular ducts, sparse, on ventral side about the regions of the last three pair of cerarii and following the last four transverse rows and bands of multilocular pores. Ventral body setae long and slender, generally distributed over the ventral side of the body, especially between the antennae and first pair of legs where they reach a length of 200 μ. Dorsal body setae sparse, very short and slender and similar to the cerarial spines in shape but smaller in size. Circulus not visible. Ventriculus long and narrow.

As far as I am aware this species is easily separated from other species of the genus *Phenacoccus* in United States by the conspicuous transverse rows of circular groups of multilocular pores on the dorsal side. In Europe there is a species very closely resembling this species in the arrangement of the multilocular pores—*Pseudococcus cycliger* Leonardi. However, the European species, described from Italy, differs from the American species in having the eight segmented instead of the nine segmented antennae, the body color yellow instead of brown and the body devoid of waxy secretion (probably due to its subterranean habits). Likewise in its habits, the American species is found on the underside of the leaves of its host plant while the other is found in the nests of *Aphenogaster testaceapilosa.* Undoubtedly the American species can withstand more rigid temperatures than the European species.

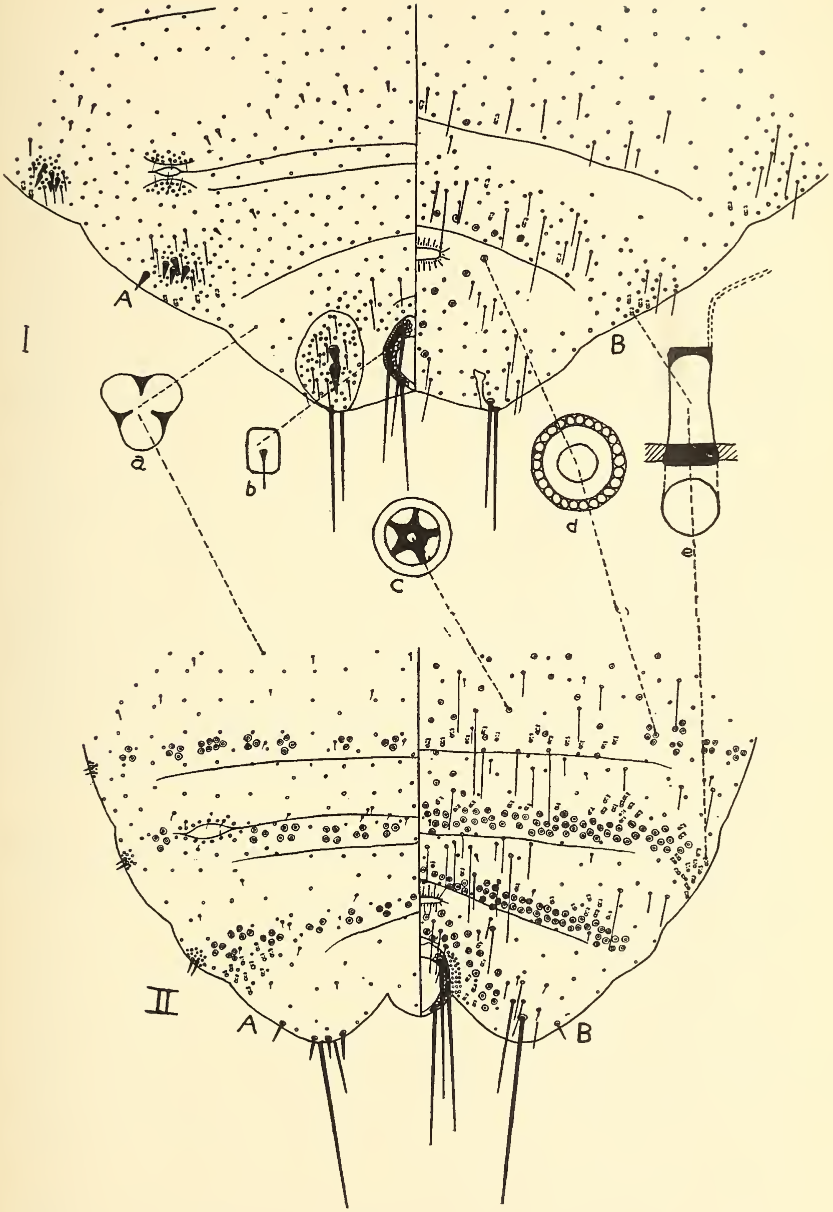
No doubt after a careful examination of *Pseudococcus cycliger,* it will be referred to the genus *Phenacoccus* since it has all the characters of that genus except the eight segmented antennae. It agrees with the genus *Phenacoccus* in having a tooth on the inner margin of the claw, multilocular pores occurring on both the dorsal and ventral sides; quinquelocular pores on the ventral side (the smaller pores in the Italian description), and from what I can make out of the illustration, 18 pairs of cerarii.

Phenacoccus saratogensis is heavily parasitized by two species of Chalcididae, notes of which will appear in a later paper.

Acknowledgment is due Mr. Joseph Donofrio of New Rochelle for his assistance in the translation of the description of *Pseudococcus cycliger.*

Explanation of Plate V.

I. *Pseudococcus cuspidatae* n. sp.
  A. Dorsal view.
  B. Ventral view.
    a. Trilocular disc pore.
    b. Ceroris of lateral orbaceroris.
    c. Quinquelocular disc pore.
    d. Multilocular disc pore.
    e. Tubular duct.
II. *Phenacoccus saratogensis* n. sp.


A
I
B
a
b
c
d
e
II
A
B

THE NECROPHILOUS HABIT IN COLEOPTERA.

By Cyril E. Abbott, Chicago, Ill.

Collectors have long been aware that certain species of beetles may be taken on decomposing carcasses. In fact it is a common procedure to set "traps" for these forms by burying jars with their open ends flush with the surface of the ground and baiting them with scraps of meat.

The beetles thus attracted represent several families phyletically not closely related. In northern Illinois these consist chiefly of Corynetidae, Dermestidae, Nitulidae, Geotrupidae, Trogidae, Copridae, Silphidae, and Histeridae. In number of species all the other families are exceeded by the Histeridae, although Silphidae and Staphylinidae also each constitute over 20% of the species taken.

The families are not, therefore, represented by anything like equal numbers of species. In fact the Nitulidae, if we except the occasional presence of *Ips quadrimaculata,* is represented only by *Omosita colon.*

On the other hand, there is no direct relationship between the number of species in a given family and the actual number of individuals. *Omosita colon* often exceeds in numbers all other species together, and although they represent only 2% of the species, the Dermestidae are often the most numerous necrophilous Coleoptera. The state of the carcass influences the population to some extent, since there is a definite, though not always obvious, ecological succession of species.

But even this succession has no relation to habit. For the skin-consuming Dermestidae may be found on a fresh carcass, while the Trogidae, with similar food habits, seldom occur in numbers before the body is reduced to skin and bones.

Reference has been made to the fact that certain species frequent decomposing flesh only occasionally. Some traps set on the Campus of Ohio State University late in June yielded large numbers of *Patrobus longicornis* and an unidentified species of *Pterostichus.* The only other Coleoptera taken on this occasion were a few specimens of *Necrophorus orbicollis.* In the above example the specimens belonged to a family characteristically predatory and not generally considered necrophilous.

This naturally raises the question as to the food habits of necrophilous Coleoptera. Until a few years ago necrophily and necrophagy were considered mutually inclusive. Necrophagy in any given species was often assumed on the basis of the casual observation that the species was necrophilous. It is the business of this paper to point out that necrophily does not necessarily indicate necrophagy, and that the explanation of necrophily does not hinge upon the use of decaying flesh as food. With this in view, let us consider the food habits of the various families of Coleoptera represented by necrophilous species.

Although a few Histeridae are found beneath the bark of trees, the bulk of the family is necrophilous. Fabre (1922) observed that the adult Saprini feed on fly maggots. This has also been my experience with a variety of Histeridae. The beetles, often several at a time, attack the maggot, chew a small opening in the skin, and extract the soft parts, leaving the empty skin with only a small hole to indicate how the insect was destroyed. Although I have never seen the larval Histeridae attack maggots, some fly maggots placed with the larvae of *Saprinus lugens,* with no possible way of escape, successively disappeared. This larva will also eat fresh beef, however, when no other food is present.

The Silphidae are chiefly necrophagous. Heymons, Lengerken, and Bayern (1926) have bred the larvae of *Silpha obscura* entirely on flesh. The adults of the same species feed on vegetation, often becoming a serious pest of garden truck. The adults kept in my cages were never observed to eat anything but meat. As Pukowski (1933) has shown, the Necrophori larvae are strictly necrophagous, and the adults are chiefly so. Steele (1927) has observed adults feeding on maggots, and those in my cages often became cannibalistic. But as Pukowski has shown, the adults will attack any large insect that approaches the material they are preparing for their progeny.

The Corynetidae are strictly necrophagous, in spite of the predacious habits of the closely related Cleridae. My specimens of *Necrobia rufipes,* both larvae and adults, thrived on the dried skins of birds.

The Dermestidae are capable of living on dried skin alone. *Dermestes caninus* may be easily bred on almost any kind of dried animal matter.

According to Fabre (1922), the Trogidae have food habits similar to those of the Dermestidae. This seems likely, for although I have not bred any species of this family, they were always found associated with dried carcasses of which only the skin, fur, feathers, etc., remained.

Omosita colon, belonging to a family of beetles which are predominantly sap-feeders, was bred by Eichelbaum (1903) on decaying flesh.

The Geotrupidae and the onthophagid Copridae were once classed with the Scarabaeidae. They have diverged in habit from their relatives by becoming coprophagous. The Onthophagi, notably *Onthophagus janus,* are known to feed on fresh fungi. Their mouth-parts are not fitted for predatory activities, and Vatermahm (1924) has demonstrated that *Geotrupes* do not depend for their nourishment, as was once supposed, on micro-organisms. Specimens of *Geotrupes splendidus,* kept in my cages, were observed feeding on decaying flesh. But on the whole, the Copridae and Geotrupidae cannot be considered necrophagous.

The studies of Voris (1934) indicate that the Staphylinidae, with the possible exception of some termitophilous and myrmecophilous forms, are predominantly predacious. Even the so-called "parasitic" species, though indubitably on the way towards true parasitism, still retain the characteristics of flesh feeders. All species which have come under my observation are predacious; *Creophilous villosus* which was bred from the egg is even cannibalistic in both the larval and adult stages. The chief food of the larger species of Staphylinidae is fly maggots. Adult beetles do sometimes feed on decaying flesh, but this is certainly not their preferred diet.

Of the nine families of necrophilous Coleoptera found in North Temperate America, one (Staphylinidae) is at least generally predacious; two (Histeridae and Silphidae) are partially so; two (Copridae and Geotrupidae) are coprophragous and saprophagous; three (Corynetidae, Trogidae, and Dermestidae) are strictly necrophagous; while finally, the sap-feeding Nitulidae are represented by one strictly necrophagous species. To this list might be added certain species of Carabidae which are only occasionally necrophilous and always, of course, predacious.

The necrophilous habit is unquestionably adaptive, but its adaptive characteristic does not depend upon necrophagy. A decaying carcass represents a concentrated and readily available, if temporary, food supply. But all of the necrophilous Coleoptera do not depend primarily upon the carcass; many depend upon other insects (such as fly maggots) which usually occur in such places.

There is no indication that predacious habits become necrophagous, although there is some indication that necrophagous forms may be predacious. Even this may not have any evolutionary significance. No doubt a more careful study of necrophilous Coleoptera will reveal characteristics common to all. One of these is the very rapid development of the larvae; another is the ability of the adults to detect and follow the slightest odor of decaying flesh. Despite the fact that they are not closely related taxonomically, these insects have gained over their competitors by taking advantage, in one way or another, of the readily available food supply represented by carrion.

A NEW SPECIES OF CEUTORHYNCHUS FROM NORTH AMERICA (COLEOPTERA: CURCULIONIDAE).

By L. L. Buchanan, Bureau of Entomology and Plant
Quarantine, U. S. Department of Agriculture,
Washington, D. C.

In his revision of the North American Ceutorhynchini (Trans. Amer. Ent. Soc., v. 23, 1896, p. 431) W. G. Dietz refers certain blue specimens from Illinois and California to *Ceutorhynchus cyanipennis* Germar, a European species now placed as a synonym of *C. sulcicollis* Payk. F. H. Chittenden (Bull. 23, n. s., Div. Ent., U. S. Dept. Agr., 1900, pp. 52–53) reports that he found *cyanipennis* at Ithaca, N. Y., in 1879, and that the species had been observed in the same locality about 1873. The name *cyanipennis* has persisted in American literature and collections up to the present time; but this reference is now known to be incorrect, and the species appears to be without valid name. Sir Guy Marshall has informed me that it is not represented in the British Museum.

Ceutorhynchus americanus, new species.

(*C. cyanipennis* Dietz and American authors, not Germar.)

Length 2.1–3 mm.; width 1.1–1.6 mm. Blackish-aeneous, elytra metallic blue or green; dorsum with very small, sparse, subprostrate setae and a few, slender, whitish scales, the scales forming a median line on pronotum and a short line on elytra behind scutellum; under side with abundant, whitish scales.

Head densely punctate, front flat or broadly and faintly impressed. Rostrum subcylindrical, one-third or more longer than pronotum, evenly and strongly arcuate, basal portion distinctly, often strongly, punctate, the sculpture (especially in male) longitudinally rugose and forming more or less distinct carinae of which the lateral one is more sharply defined; apical portion of rostrum sparsely punctulate; antennal socket submedian in male, slightly basad of middle in female; funicle 7-segmented. Prothorax wider than long (4^+ to 3), sides strongly converging anteriorly from basal third or fourth; subapical constriction not very deep, extending across dorsum; anterior margin moderately elevated, often faintly emarginate medially, without cusp but occasionally with minute asperities laterally. Pronotum densely punctate, lateral cusp feeble; median channel deep basally, obsolescent at middle, shallow subapically, not reaching apex; median scaly line vitrually complete, though in most specimens narrowed or interrupted medially and abbreviated anteriorly. Elytra with humeri moderately prominent, sides slightly rounded and gradually converging to beyond middle, then strongly converging to apex; striae rather coarse, punctate, each puncture with a minute seta; subapical acute granules relatively smaller than in *erysimi*; intervals subplanate in general (sometimes in part broadly and feebly convex discally and a little more strongly convex basally), each interval with a double (sometimes partly triple) row of setae discally, the setae on some or all intervals on apical declivity, and also on narrowed basal portions of some intervals, reduced to a single row; setae on interval 6 forming a double to a staggered single row, very rarely a subregular single row; postscutellar line confined to interval 1, varying from very short to one-fifth elytral length. Scales of under surface rather dense on sterna, especially so on sides of meso- and metasterna, somewhat sparser on lower half of prothoracic flanks, on side of abdomen, and on abdominal sternites 3, 4, and 5 medially, elsewhere still sparser to absent. Legs with whitish, seta-like scales, and also a few slightly coarser scales which form a U-shaped mark bordering gonytheca (the distal femoral cavity which receives end of tibia) ventrally, and also a cluster around the femoral tooth on hind and middle legs; femoral tooth well developed on hind and middle legs, smaller to obsolescent on front legs; claws distinctly toothed.

Male.—Abdomen broadly impressed basally, sternite 5 with deep, median impression (deepest apically) occupying nearly one-third the width, and most of the length, of sternite, the side margins of impression with a few, very fine, erect hairs; middle and hind tibiae mucronate.

Female.—Abdomen not impressed basally; sternite 5 subplanate to slightly impressed medially; tibiae not mucronate.

Type locality.—Iowa City, Iowa, May 19, Wickham.

Type.—Male, and paratypes, male and female, Cat. No. 52214 U. S. National Museum. Described from about 118 specimens.

Distribution (paratypes).—*New York* (Ithaca, Ilion, Buffalo, Orangeburg); *New Jersey* (Hillsdale); *Maryland* (Plummer Island); *Indiana* (Knox); *Illinois* (southern); *Wisconsin* (Madison); *Iowa* (Iowa City, Independence, Guttenberg, Williamsburg, Sibley, Estherville, Lake Okoboji, Spirit Lake); *Missouri* (St. Louis); *Kansas* (Wellington); *Arkansas* (Fayetteville); *Mississippi* (Natchez); *Louisiana* (Tallulah, Baton Rouge); *Texas* (Mesquite, Dallas, Gainesville); *Colorado* (Greeley, Rocky Ford); *North Dakota* (University); *Idaho* (Pocatello).

British Columbia (Salmon Arm); *Alberta* (Edmonton); *Manitoba* (Aweme); *Ontario* (Toronto); *Quebec* (Montreal).

Host plants.—"On radish," "on horse-radish," "on *Lepidium*" (Madison, Wis., L. G. Gentner); "on alfalfa" (Mesquite, Tex., E. S. Tucker); "on cultivated mustard" (Tallulah, La., R. A. Cushman); "bred from L. virg." (this doubtless is *Lepidium virginicum*) (Baton Rouge, La., C. E. Smith); "on mustard" (Baton Rouge, La., C. E. Smith); "collected on petsai" (? Chinese cabbage) (Baton Rouge, La., T. H. Cutrer); "on horse-radish" (Rocky Ford, Colo., H. O. Marsh).

The green or blue elytra, 7-segmented funicle, toothed femora, and toothed tarsal claws distinguish *americanus* from all American species except *aeratus* Dtz. The latter, the type of which I have been able to examine through the courtesy of Dr. Hugo Kahl, was described from a single Ohio male having dark-aeneous elytra and, supposedly, nonmucronate tibiae. The only other specimen of *aeratus* known to me is an Ohio male which, Dr. Kahl notes, was pinned unidentified between *aeratus* and *bolteri* in the Ulke collection at Pittsburgh; this specimen undoubtedly belongs to *aeratus*, though its elytra are metallic green instead of aeneous as in the type. In both specimens (males) the hind and middle tibiae are mucronate about as in male *americanus*.

The chief external differences between *aeratus* and *americanus* are:

Length 2.2–2.3 mm.; elytra aeneous or green; elytral intervals narrower and obviously convex throughout; elytral setae fewer, their prevailing arrangement uniseriate, with biseriate, but never triseriate, stretches; setae on interval 6 forming a nearly regular uniseriate row . . . . *aeratus*

Length 2.1–3 mm., usually at least 2.5 mm.; elytra blue or green; elytral intervals broader, subplanate as a rule, occasionally feebly convex in places but never convex throughout; elytral setae more numerous, prevailing arrangement biseriate, with short stretches subtriseriate; setae on interval 6 almost always partly biseriate. *americanus*

As stated above, the elytral intervals of occasional specimens of *americanus* appear slightly convex discally, but if the angle of view is shifted these intervals, at least in places, are seen to be flat or virtually so; whereas in *aeratus* the convexity of the intervals is obvious throughout, regardless of the angle of view. There is scarcely any doubt that *aeratus* and *americanus* are separate species, even though categorical distinctions are not evident.

BOOK NOTES.

The Male Genitalia of Orthopteroid Insects, by R. E. Snodgrass. (Smithsonian Miscellaneous Collections, vol. 96, no. 5. Pp. 1–107, figs. 1–42. Smithsonian Institution, Washington, D. C.)

Dr. Snodgrass in this work carries a step further his remarkable series of monographs on insect morphology. In this, he correlates his findings in the study of orthopteroid genitalia into a concrete whole and applies them to the phylogeny and classification of this large and important group of rather primitive forms. On genitalic evidence, he places the Isoptera, Embioptera, Zoraptera and Grylloblattoidea in the great orthopteroid complex, with the other better known groups of the phasmids, mantids, blattids, tettigoniids and acridids, in the broad sense. The introduction relates the development of the male gonads, genital ducts and external genitalia. The Orders and Superorders are then treated seriatim in much the same manner. The work concludes with a list of references and a species index. The forty-two text figures are, as always with Dr. Snodgrass' work, examples of what such drawings should be, remarkable alike for their clarity and precision. J. R. T.-B.

The Natural Vegetation of Arizona, by A. A. Nichol. (Technical Bulletin no. 68, College of Agriculture, University of Arizona.)

To those entomologists who have received insects from the State of Arizona, this is a most interesting as well as useful work. We so often have but the vaguest idea of what this State is climatically and vegetatively. We are too prone to remember the old story of the soldier who needed blankets on his arrival in Avernus after a protracted stay in Arizona. But we forget the altitude range and the rainfall in the mountainous and more northern parts of the State, where we don't have to wait for translation to require warmer clothing for a sojourn there.

How many of us know that forests cover one-third of the State? Or that one-quarter of its area is grassland? Even though 42% is so-called desert, it is covered with plant growth, which, if sparse, is crowded as closely together as extensive spreading root-systems allow.

Prof. Nichol carefully discusses the plant associations to be met, their altitudes and constitution, as well as the ecological factors that govern them.

An excellent feature is the tinted map of the State showing the vegetation areas.

Professor Nichol is to be congratulated on having produced so worth while and valuable a piece of work. Useful as it will be in many ways to Arizonans, biologists and ecologists in other States will find it a source of accurate data. Professor Nichol is a man to produce nothing but what is true and accurate. J. R. T.-B.

A Glossary of Entomology. Smith's "An Explanation of Terms Used in Entomology." Completely revised and rewritten by J. R. de la Torre-Bueno. (1937. Published by the Brooklyn Entomological Society. ix + 336 pp., 9 plates.)

The long-awaited "New Glossary" is now in our hands, entering upon a career of service which I confidently predict will be as long and distinguished as that of its more modest predecessor. The natural growth of Entomology, as well as its unexpected importance in new fields—such as Medicine and Genetics—steadily add to the terminology, so that the lexicographer's problem is perhaps not so much the definition as the choice of the terms. Mr. Bueno has been reasonably successful in both. In his choice he seems to have been guided primarily by the needs of the student of Hexapoda, or true Insects, the Glossary being less complete for the Arachnida, Myriapoda and Crustacea. On the other hand, one might perhaps feel unjustified by the inclusion of MacGillivray's rather unnecessary neologisms.

In the matter of definition the author has been ruled sagely not merely by the original meaning, but even more so by the modern consensus of usage. "Priority" is troublesome enough in purely taxonomic matters, where, moreover, there are signs that its popularity is on the wane. It has little or no place in terminology, except for those historically inclined. There has been of late much superfluous quibbling over the meaning of some commonly used terms, such as chitin and symbiosis. In such matters it may be well to remember Francis Bacon's words (The Advancement of Learning, I): "Here, therefore, is the first distemper of learning, when men study words and not matter."

There are some particularly praiseworthy features in the new Glossary, such as the lists of Latin abbreviations and of symbols. The clearly explained drawings will be a boon to the beginner, as well as to the more advanced student when he is called upon suddenly to cope with a group outside his specialty.

The printing is clear and the type easy to the eyes, while the binding promises to stand up to a fair amount of rough desk wear. Mr. Bueno may well be congratulated on having so successfully completed a wearisome task. His work will stand as another milestone in the history of the Brooklyn Entomological Society.—J. Bequaert, Department of Tropical Medicine, Harvard Medical School, Boston, Mass.

EDITORIAL.

ON KEYS AND DICHOTOMIES.

"The voice of one crying in the wilderness."

On occasion, we have remarked on keys and dichotomies, their purpose and form. Again we inquire.

Of course, our (profane) familiarity is with the writings of hemipterists; and perhaps we generalize from insufficient data. But, while we do not employ critically keys in other orders, our editorial labors bring them forcibly to our notice.

What is the purpose of a key? Is it a form of puzzle to sharpen the lagging wits of entomologists? Is it a vehicle for erudition to confound the unlearned? Or is it a thing for concrete and exact use?

There is only *one* fundamental purpose for any key in any biological assemblage of forms, whatsoever that may be—that purpose is to make known to the user of the key what has heretofore been unknown to him. A key should deal only with concrete, positive, fundamental structures, with positive visible differential characters; not with tenuous abstractions, nor with ifs, buts, or ands. No key should say

"Wider and more pilose . . . . *smithii*
Narrower and thinner pile . . . . *robinsonii*."

If we have in hand either of the species, and don't know the other, where are we? And if we happen to have an aberrant specimen of either, again, where are we?

The underlying assumption in many keys is that the user has numerous species and specimens before him and that by concentrated study he has absorbed the limitations of the characters and the general facies of the group; whereas, in fact, keys are used to determine unknown specimens, far too often singletons, which are not within the knowledge of the user of the key. And even when it comes to positive characters, an intensive worker in any group acquires a vast discrimination of subtle and far too frequently elusive characters, characters discernible only under certain conditions of light or under certain magnifications. And the author mentions neither! The writer has seen ocelli where none should be—a different angle of light and lo! they were obviously circular, shiny deep pits. This can happen to any one of us. Our remedy is correlated, positive, structural characters of demonstrated stability; and where these should be variable, to indicate numerically their variation.

And we must not forget that dimensions are positive key characters, just as much so as antennal proportions or genitalic structure, or armature, or any other structural feature.

Let us next look into the form of a key. How often have we seen indented keys of great length, in which the last lines taper down to the vanishing point, like "The Tale of a Mouse" in Alice in Wonderland! And some such keys have not even letters by which to identify corresponding indents! This is left to the natural ingenuity of the user! Such keys are hard to use, confusing, and very wasteful of fair white paper. How often have we seen keys in which occurs the good old phrase, "if not so, then"? Or again, a key which leads to three or more closely related species, which are simply set off more or less descriptively, one under the other? Or perhaps one of these "A--AA" keys, where the alphabet is exhausted and the author has recourse to a whole galaxy of mathematical symbols or astronomical signs, like an astrologer's mantle? (Editors have been known to receive pointed requests to print such aberrations as submitted, in all their glory!)

There are many rumblings about on the theme that biology is as much an exact science as, say, mathematics or chemistry. But no one seems to apply such exactness to descriptive entomology and far less to the construction of keys. Of course, the great deterrent is exactness—a little thing that demands high discriminating talent, much labor and a fixed and exact use of a concrete and invariable terminology. It also calls for the rejection of all vague and wordy subjective concepts in favor of exact terse objective actualities. When a writer says "more rounded" he introduces a subjective norm of his own, unapprehended by his reader; or else, he begs the question and sets two unknown things one against the other, which is far from exactness.

The best device to overcome these weaknesses is a key in the form of a pure dichotomy, with serially numbered couplets. The couplets, of course, to be on the "yes" and "no" plan, *i.e.,*

1.–"Ocelli present 2
Ocelli absent . . . . 3"

Such a precise statement leaves nothing open to interpretation. It is or it isn't. And so on through, omitting all comparatives, all "antennae longer," "antennae shorter"; "insect broader," "insect narrower." In fact, all comparative dimensions should be susceptible of numerical treatment, as for instance, "length : breadth : : 5 : 3"; "antennal joints I : II : III : IV : : 7 : 11 : 5 : 14." Or again, when we come to color—and only such colors as are fixed and unfluctuating characteristics of species or group,—it is one thing to say "piceous" and quite another "black approaching piceous"—all the difference between definiteness and vagueness. Few people have such a fine color-sense, and even they cannot see the identical color under varying conditions of light, either as to source, quality or angle.

These are but a few of the vague moments in keys; and just an idea as to how they may be corrected. Doubtless our readers can supply each his own horrible example of a key.

In brief, our argument and our plea are these: Keys are strictly for use in determining the unknown by persons relatively unfamiliar with the matter in hand. Keys should therefore be cast as pure dichotomies with numbered couplets, employing only positive, objective, visible characters, without any loose wording or comparatives.

J. R. T.-B.

METHODS AND TECHNIQUE.

Notes on Collecting Diptera.

When we confine our interests to one particular group of insects we are apt to find that certain methods of collecting those insects are better than others. The writer found this to be true while collecting Diptera on the Pacific Coast. Perhaps some of these methods might be of interest to others.

A Net for Capturing Insects Resting on Tree Trunks.—Many western Asilidae, particularly of the genus Cyrtopogon, rest habitually upon the trunks of standing trees. Some species are easily captured with an ordinary net because once the net is over them, they fly upward and into the tip. Others fly only a short ways upward and then downward, escaping from beneath the ring because it cannot rest flat against the rounded surface of the tree trunk. The following sort of a net increased the number of downward-flying specimens captured by at least fifty per cent.

An oval-shaped ring, 2½ inches wide and 7 inches long, was made. The shank was fastened to a bamboo handle 30 inches long, and then bent at a right angle to the handle. A cone-shaped net 18 inches long was sewed to the ring. The net was kept spread open by a string from the tip which was tied to the handle. Once such a net is placed over a specimen, usually with the long axis parallel to the long axis of the tree trunk, the insect has no chance to escape because the entire ring fits snugly against the curved surface, particularly of trees with a diameter of 6 inches or more. If the insect persists in remaining on the trunk, the net can be easily loosened by untying the string and then the creature can be picked up with the sides of the net.

Bombyliidae Collecting.—Bombyliidae require very careful handling when captured in order to prevent the pile from being abraded. Abraded specimens are very difficult to identify—in fact, some species are beyond identification when the pile has been badly rubbed. In order to get desirable specimens the writer used the following technique: Only two or three specimens were placed at one time in a test tube killing bottle. When the flies were dead they were pinned immediately and kept in a carrying case. This case was made by lining the four sides of a cigar can, such as are used for packing a half dozen cigars for gifts, with cork. The cans used were approximately 1 × 3½ × 5 inches. They were carried in suede leather sacks which were made to just fit over the cans, the sacks being provided with belt loops so that two or three could be easily carried on a belt.

A Pocket Pinning Block.—In order to properly space the specimens on pins, a pocket pinning block was made from a piece of copper tubing of small diameter. One tube was cut to the right length for the spacing of specimens from the top of the pin, while another tube was made for spacing from the point. Discs of copper were soldered over the ends of the tubes. The disc of one end was punched for the head or the point of the pin. Both tubes were fastened together with solder.—CHAS. H. MARTIN, Ithaca, N. Y.

Alydus on Carrion.—Additional to my note in the October BULLETIN, p. 159, at Roseville, Ohio, on September 22 of this year, I found approximately 40 *A. eurinus* feeding on the dried carcass of a sheep.—STANLEY W. BROMLEY, Stamford, Conn.

PROCEEDINGS OF THE SOCIETY.

Meeting of March 11, 1937.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, March 11, 1937, at 8.15 p. m.

President William T. Davis in the chair, and 11 other members present, namely, Messrs. Buchholz, Cooper, Dietrich, Dietz, McElvare, Moennich, Ragot, Sheridan, Shoemaker, Siepmann and Stecher; also Dr. A. Glenn Richards, Jr., Messrs. Richard Fisco and John J. Kellner, and Miss Dietz.

The minutes of the previous meeting were read and approved.

Mr. Herman Moennich spoke on "Beetles Found in Fungus," illustrating his talk with specimens of beetles and fungi. He made an attempt to associate the various beetles with the particular species of fungus on which they occur. Mr. Moennich said that most American authors merely stated that a particular species of beetle was found on fungus, but did not specify what species of fungus. Weiss and Dury were perhaps the only authors to do anything at all along this line. Mr. Moennich's list of beetles will be published separately in the Bulletin.

Dr. A. Glenn Richards, Jr., of Cornell spoke on "Biological Notes on the Salt-Marsh Mosquitoes of Long Island." The distribution of mosquito species on the salt marsh, Dr. Richards said, has nothing to do with the topography of the marsh, but depends entirely upon the salinity of the surface water, which fluctuates from time to time as it is affected by rains and the tide. The salinity of the surface water is little affected by the degree of salinity of the underlying turf, but unusually high tide or heavy rain will tend to raise or lower the salt content of the surface waters. From the level of low mean tide, to the levels of daily mean tide, full moon tide, and storm tide, the salinity of the surface water progressively decreases.

Aëdes sollicitans occurs in the area of the highest salt content, some 10 to 15 per cent of salt, which is situated just a little above high mean tide.

Aëdes cantator is usually found in water of 6 to 8 per cent salt content, although it will survive greater salinity.

Aëdes vexans (*sylvestris*) prefers water from 0 to 1.5 per cent salt content.

In studying the salt marsh mosquitoes of Long Island, only the three species of *Aëdes* need be considered. The one species of *Anopheles* that once occurred is no longer common. This malarial mosquito all but disappeared from northeastern North America about twenty years ago for some unknown reason. It has been suggested that the severe winter of 1917–1918 might have killed them off, but small numbers are still present, and one would suppose that, since the decimation took place twenty years ago, they would have come back to their former numbers by now. Someone else has suggested that it might have been due to the pollution of the waters.

Aëdes will breed in fresh water directly in the salt marsh, but will not breed in fresh water, say, 80 feet away. The reason for this has not been clearly established. The adult mosquitoes sometimes fly for as great a distance as 50 miles. The eggs are laid by the adults on mud the season before they hatch; it is reported that the eggs die if laid on water.

The southern coast of Long Island is protected by a barrier reef enclosing large bays; in the bays there are small islands. Some of these islands have been ditched for mosquito control, and others have not. Those which have not been ditched do not necessarily breed mosquitoes. The daily fluctuation in tide in Jamaica Bay, for instance, is from six to eight feet. This entirely covers the islands at high tide, washing away the mosquito larvae and bringing in the killifish which eat them.

On the other hand, around the west end of Moriches Bay, for instance, where the islands are no higher above mean sea-level than those in Jamaica Bay, the islands may be prolific breeders of mosquitoes. These islands are well away from the inlets through the barrier beach, of which there are only three between Far Rockaway and Shinnecock Bay. The daily fluctuation in tide is only from six to ten inches. The islands are not submerged every day, and are completely covered only at exceptional times. Such islands have to be ditched.

Dr. Richards also spoke of the argument now waging between the mosquito control people, who advocate draining the marshes, and the conversationists who claim that ditching disperses the wild life in the marshes.

The effects of ditching are twofold. First, it slightly changes the character of the vegetation. After a few years a row of shrubbery grows within a distance of from three to five feet on both sides of the ditch. Second, it removes the surface water: the little puddles from three to six inches deep.

Conservationists claim that ditching not only takes off the surface water but lowers the water table as well. This is what one would expect to be the case. Experiments by Mr. Norman Taylor, however, show that actually this is not the case.

Tests were made by drilling test holes in ditched marsh at various distances from the ditches. These test holes are permitted to fill at a time when the entire area is covered by the tide. An hour and a half or so after the tide has receded, the water level in the holes drops about four inches, and then remains constant. Test holes nearer the ditches show no greater drop than those at a distance. The same amount of drop is noticed in test holes in unditched marsh.

Dr. Richards explained how ditches drain off the surface water without lowering the water table. The ditches are put in with reference to the topography of the marsh, and spurs, not as deep as the ditches, drain the pools directly into the ditches.

Mosquitoes frequently go on long migrations. They are always females, and they are reported to be sterile. Migrations can be traced by staining mosquitoes with an alcohol soluble stain, liberating them, and recapturing them elsewhere. If a stained mosquito is put in alcohol, the alcohol takes on the color of the dye. Mosquitoes can migrate across Long Island in two days. This can be observed, for instance, when mosquitoes are unbearable at Fire Island, then disappear, while reports of mosquito invasions come in from towns to the north.

In regard to the abundance of mosquitoes, Dr. Richards said that in one instance he had taken up a pint dipper of water containing mosquito wrigglers and drained from it two tablespoonsful of water. The rest was mosquito larvae.

In response to a query by Mr. Davis as to why there are so many synonyms by Dyar and Knab in the book "Mosquitoes of America," Dr. Richards explained that more students of mosquitoes now separate the species by the larvae than by the adults. The earlier names which have priority were based on the descriptions of adults. Dyar and Knab worked with larvae and based their descriptions on larvae. They didn't always know which larva corresponded with which adult, and proceeded to name all the larvae, more or less disregarding the adult. As a result many of the Dyar and Knab names based on larvae are synonyms, while names based on adults have priority. In respect to nine synonyms by Dyar and Knab for a single species, it was pointed out that it was easier to make a name a synonym later than to risk misidentification in so important a work.

Mr. Buchholz exhibited 31 species and forms of *Papaipema,* representing all that occur within fifty miles. His specimens were beautifully mounted, and were degreased with naphtha.

The meeting adjourned at 10:00 P.M.

Carl Geo. Siepmann,
Secretary.

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Vol. XXXIII 1938

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J. R. de la TORRE-BUENO

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G. P. ENGELHARDT CARL GEO. SIEPMANN

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BULLETIN
OF THE
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VOL. XXXIII FEBRUARY, 1938 No. 1

WITHOUT BENEFIT OF INSECTS*

By EDITH M. PATCH, Orono, Maine.

"In the large economy of nature insects are beneficial."

It was in the year 1901 that I heard Dr. O. W. Oestlund make that statement, but I doubt if he has changed his mind—so there can be nothing unfair in quoting him. Indeed, it was not a mere opinion but a fact, stated by a philosopher as well as a learned entomologist and a most stimulating teacher.

There is, of course, nothing either new or controversial about Professor Oestlund's declaration. We are all aware, and no one disputes, that *"in the large economy of nature, insects are beneficial."* We take their help for granted. Why not?

Their gracious bounty has never failed mankind. We have abundant food, in the form of fruit and vegetables, as an incidental result of the pollen-activities of insects. If the meat of legume-grazing cattle and sheep varies in price from year to year, it is not because the insect-guests of clover or alfalfa have been offering us a new deal! From southwestern deserts to northeastern fields, flowers in their seasons spread the glory of their colors in unconscious acknowledgment of bees and butterflies and moths—toiling in day shifts or night shifts as the need may be. And the jubilant voices of singing birds can gladden us because the insect diet of their nursery days is still available.

And yet, to some of us come moments of doubtful query. Are these and many other blessings bestowed by the grace of hexapods assured to mankind forever and ever, Amen?

A hint of possible future danger was passed on to me thirty-five years ago when the before-mentioned O. W. Oestlund told me in serious manner and tone, *"IF the time ever comes when insects*

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* Annual Public Address of the Entomological Society of America, Atlantic City, New Jersey, December 29, 1936. (With some omissions.)

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are fought to the extent recommended by economic entomologists there will be in consequence the greatest of economic disasters—due to the scarcity of insects."

If this question were open to debate, some might discuss it in all seriousness and some might discount it with the comment that no one but an emotional sentimentalist would even bring up such a matter for consideration; adding, perhaps, that it is obviously silly to worry for thirty-five years only to find the prophesied disaster still remote.

However, this is not a debate—or even an argument. Hence it will suffice to recall that the prophecy of thirty-five years ago began with an "IF". At that time this IF was a large one—sufficiently large to safeguard the lives of enough insects to attend to our physical needs of food and clothing, and our aesthetic delight in color of flowers and song of birds. For there were not then available facilities to fight insects to the extent that seemed desirable to economic workers.

Such a challenge would not be disregarded by Man. If his goal is a wholesale destruction of dangerous insects, his brains will provide the equipment for such a campaign in the course of time. Indeed, some progress has been made. For a number of years, North, East, South, and West, *dusting airplanes* have been steered over orchards and forests, over impenetrable swamps, over fields of sugar cane, cotton, and so on. Fifty thousand acres of cotton dusted in Texas alone! The poison dust may cover 500 acres an hour! *Airplane vapor spraying* also has passed the experimental stage. A few years ago in one state 1,000 acres of peaches were sprayed in two days and two hours; and we are assured that airplane application of oil sprays has proved to be fast, efficient, and economical. (Metcalf and Flint 1928, p. 296; Dunn 1932.)

As one would expect, electricity has entered the field of insect control. Now, if an orchardist tires of having his apple crop devoted to the propagation of codling moths, apparently all he needs to do is to flood his trees with artificial daylight, during those dusky hours scheduled by the egg-layers for their work. There being no darkness, they can lay no eggs!

After experimental ventures with electro-magnetic waves, we are told that it is apparently definitely indicated that methods for the use of electro-magnetic waves are worth while developing for insect control. (Headlee 1931.)

In defiance of the conclusion held for years by most economic entomologists that *light traps* are not a practical method of control, bigger and better light traps now have entered the field and are viewed with interest by all, and by some with favor.

In one way and another, Doctor Oestlund's IF has been reduced from large capitals to small italics. Insects are already combatted on a scale impossible in 1900; and the real wholesale campaign, perhaps, has but begun. Are there entomologists who believe that concealed in the efficiency of our present and future program there may be a boomerang of disaster?

Possibly. One hears disquieted and perhaps disquieting murmurs here and there. Even the *light trap* has not escaped. In February, 1935, an officer of an electric company wrote the following letter:

"We have been approached a number of times with the problem of devising insect traps to be baited with blue and ultra-violet lamps of our manufacture. We have hesitated so far because we were not entirely sure of the economic soundness of such wholesale killing, believing that not only the undesirables might be killed, but also there might be a wholesale slaughter of the innocent.

"To establish a basis of judgment of this economic entomological question, I am asking your advice as to the soundness of the use of blue or ultra-violet light as a trap bait for methods of protecting some of our plant and tree growths. I hope that you will express yourself freely for I am concerned solely with the fundamental truth in this problem."

This letter was addressed personally to a number of entomologists in the United States and Canada. I shall not ask you to listen to my own reply. Instead, I am substituting the response of one of the other entomologists consulted who wrote a briefer and more concentrated letter as follows:

"I am of the opinion that traps primarily intended to kill the codling moth but certain to kill beneficial predacious and parasitic insects will in general do more harm than good. They are like releasing poison gas in a restaurant to kill a hold-up man. There is no doubt concerning the efficiency of the blue to ultra-violet radiation in attracting photopositive insects of which the codling moth is one. However, such radiation attracts also such things as Chrysopidae (enemies of plant lice), many Ichneumonoidea (enemies of a great variety of plant-feeding insects), and aquatic insects that are the natural food of fish. Furthermore, I am not convinced that lighting an orchard during the night will not actually increase egg-laying by the codling moth in spite of killing a certain number of adults. Even if it did not, I would still be opposed to a wholesale 'slaughter of innocents'."

As some may know, a significant number of the replies were in accordance with the one just quoted.

That poison campaigns have already greatly influenced the insect fauna in certain localities there can be no doubt. The late Charles Johnson (Boston Museum Society of Natural History) once told me, "I have to come to Maine to get the larger Lepidoptera now. No use looking for them in Massachusetts since the general spraying for gipsy and browntail caterpillars."

It is natural that such observations should come first from museum entomologists; but is the fate of certain native insects an affair for *museum regrets* only? Is not the reduction in native pollinators already influencing agricultural practices? It is becoming increasingly desirable, if not necessary, for instance, that growers of berries and orchard fruits should also be owners or renters of hive bees.

According to Barclay (1928) the orchard districts in New Jersey are surrounded by an extensive trucking area, and as a result wild bees of all kinds are scarce. He states, that since 1918, the use of hive bees for pollinating purposes has increased steadily. One hundred colonies were rented in 1918; 1,600 colonies were rented in 1927. Prices ranged from $5 to $8 per colony. Blueberry and cranberry growers are faced with a problem similar to that confronting the orchardists.

To be sure, not all orchard areas are yet dependent upon honeybees. W. H. Brittain in 1933 (p. 133) stated: "The great present scarcity of hive bees in the Annapolis Valley accentuates the importance of a knowledge of the native fauna concerned in apple pollination. It was found that the most important agents at the present time in apple pollination were various species of solitary bees. These bees are found everywhere nesting in the ground in roadside banks, pastures sparsely covered with vegetation, the drier parts of dyke lands, and similar situations."

It has been known for many years that bees are liable to be poisoned by spraying the bloom of fruit trees. Why, then, cannot all danger to pollinators be avoided merely by not spraying fruit blossoms?

Because the problem is not so simple as that. As W. H. Brittain states (1933, p. 189): "It is often assumed that poison applied to the fruit bloom is the chief or sole cause of loss, but this is not the case. Severe cases of poisoning before and during bloom are sometimes attributable to poison obtained from dandelion bloom growing in or near the orchard. Later cases of poisoning were mainly traceable to wild radish; but many other plants may serve as sources of poisoning due to the drip or drift of poisoned sprays or dusts. . . .

"It is impossible to maintain apiaries anywhere in the entire fruit belt at any time from May until August, without incurring some risk of loss.

"Samples of pollen taken from the nests of solitary bees showed ponderable amounts of arsenic, more than enough to destroy the larvae of hive bees. Evidence of depletion of the solitary bee population from this cause is difficult to secure and requires further observation."

We lack knowledge of the extent to which most of the pollinating insects are killed by poison sprays and dusts. The domesticated honeybee is the only species concerning which we have a really significant background. It seems reasonable to assume that the fate of honeybees is shared by solitary bees and bumblebees and by many other flower guests. It is because of this assumption that I am devoting so much time to *chemical poisoning of hive bees,* a subject that is receiving increased attention all the way from Nova Scotia to California; and it is a 1936 circular issued by the California Agricultural Extension Service from which I next quote:

"Honeybees are very susceptible to all stomach poisons, such as the arsenates, fluosilicates, nicotine (although tobacco *fumes* act as a repellent), Paris green, thallium, and rotenone. Even such a small quantity of arsenate as one-half part per million will cause the affected bee to leave the hive or to lose the power of muscular coördination. The use of powdered poisons in controlling insect pests, especially when, as in airplane dusting, the poison is not confined to the treated field, is particularly dangerous. In airplane dusting at least 50 per cent of the poisons drift for great distances, poisoning all vegetation with which they come in contact. Poison clouds may travel at least three miles and at that distance will still be sufficiently concentrated to kill bees feeding on the nectar of flowers where poison falls.

"The bees gathering poisoned nectar die in the field, while the pollen bearers carry back to the hive with the pollen sufficient poison to kill the nurse bees and the larvae.

"Since chemical poisoning of this type menaces the welfare of beekeeping more than all the diseases put together, the beginner should choose his territory carefully until the practice of applying poisons to growing crops is properly regulated." (J. E. Eckert, 1936, p. 60–61.)

Evidently European beekeepers have similar troubles, for according to Hilgendorff (1926), the application of arsenical compounds by airplane to forests in eastern Germany a few years ago for the control of the "fir noctuid" moth and the "nun" moth caused a serious bee mortality to neighboring beekeepers and claims for damages were instituted.

While presenting this phase of the subject, I cannot refrain from repeating that classic protest that came from the State of Washington nearly sixteen years ago (Melander, 1921, p. 92): "In return for their good services as pollinators, many bees have met a pitiful death at the hands of those they help. Many colonies have been completely wiped out. Other colonies have been so depleted that they have failed to build up even in time of full honey flow. The destruction of adults and the failure of the brood to mature and take the place of the slaughtered innocents have so demoralized hundreds, yes tens of thousands, of colonies as to make them subject to the ravages of wax-moth, disease, and winter-kill. Instead of producing honey these colonies must be fed that the remnant may survive. The money loss to beekeepers amounts to thousands and thousands of dollars.

"Shocked to realize that their neighbors should be so thoughtless of the rights of others, the bee-keepers move from the orchard districts to avoid actual extermination. It is their silent protest but their best retaliation, for they realize that they are outnumbered by the growers of fruit who will continue the warfare against the codling-moth even though it carries with it the destruction of the non-combatant honeybee."

It is logical to anticipate that bee-owners will continue to defend the lives of their domestic insects to the best of their ability. But what about the fate of those other insects that are "beneficial in the large economy of nature?" Will the voices of their champions be heard?

Some such champions do exist, and their voices are raised and heard, now and then,—whether heeded or not! One of the foremost of these, as you know, is the Curator of the Department of Insect Life at the American Museum of Natural History, whose radio broadcast on *The Friendly Insects* was published in *Natural History* (Lutz, 1926). In 1931 this same champion gave, in one of the *Science Service* Radio Talks, under the title, *Insects Versus the People,* an account of the relationship of insects to the maintenance of life on the earth, and their contributions to the processes of nature.

In 1933, Dr. Gayle Pickwell edited a book on *Insects,* published for the Natural Science Department of San Jose State Teachers College. The preface to this book begins: "Insects cannot be overemphasized. They are in constant competition with man; they constantly play the rôle of benefactor to man. . . ." The title of

Chapter 15 is *The Value of Insects.* In this chapter Gayle Pickwell states "Human society, as it is now constituted, could not exist without insects"; and presents his evidence in a convincing manner.

A year later we hear again from the American Museum of Natural History. This time it is C. H. Curran who devotes a fair share of his book on *North American Diptera* to the good insects do. Anent the *Insect War,* he says: "I am aware that there has been some sensational propaganda about 'the war against insects' and I cannot forego a few remarks. Insects are our best friends and we owe a great deal to them. They are also our worst enemies but this fact should not be proclaimed from the housetops without at the same time crying much louder of the benefits they give us. . . . The stressing of the danger of the 'insect menace' may do entomology a great deal of harm and I think it has already done some."

Perhaps no agricultural situation has ever presented a more serious dilemma. On the one hand, if we do not destroy enough of certain insects, they may ruin some of our crops. On the other hand, if we proceed to destroy too many insects, we shall have almost no crops at all except such as are wind-pollinated.

If every one does not realize the possibilities of the first mentioned disaster, the extent to which we may be damaged by insects, it is not the fault of entomologists who for years have been distributing literature and ammunition for the necessary warfare. As for our debt to insects, too few do realize our dependence upon them for most of our food and clothing, a significant amount of our industry, and for much of our pleasure. Certainly too little popular emphasis has been given to the service of insects to mankind. One wonders if the time has not arrived when more entomologists should be employed to study the status of beneficial insects and to promote their welfare.

Why babble before a group of learned entomologists about the long-known subject of insect pollination activities? Not, of course, because I doubt their knowledge of this subject all the way through the flower alphabet from Apple to Yucca and Zinnia. Rather I am confiding certain perplexities of my own. Now and again I find myself wondering whether we are justified in taking for granted the perpetual continuance of our seed crops.

In their recent book, *The Biology of Flowers,* two Oxford botanists (James and Clapham, 1935) make this significant statement: "Interesting examples are known of flowers which do not possess the possibility of self-pollination and which seldom set seed because insects for whose visits they are strictly specialized have become rare. Among British plants the Greater Bindweed, *Convolvulus sepium,* has a very long corolla-tube and only the Convolvulus Hawkmoth, *Sphinx convolvuli,* normally visits it for nectar. This moth is now rare in this country, and the flowers produce seed only as an occasional result of visits by other insects."

Possibly both Europe and America might be as well off without this bindweed, also christened "Devil's Vine,"—so why worry if it does fail to have seeds? But what about other plants pollinated by hawkmoths? Among them are tobacco; night-scented stock; sweet-scented, climbing honeysuckle; white Madonna lily; the splendid, white Martagon lily; the Bermuda lily; some of the garden gentians; vernal crocus; several kinds of sweet-scented Gardenia; a number of orchids in the genus *Habenaria;* and so on.

Will a time come when the Tobacco Growers of America assemble to discuss an appalling scarcity in tobacco seeds? As an emergency measure will they engage entomologists to rear hawkmoths for the purpose of pollinating tobacco blossoms? Will seed-growers for garden and truck-vegetable crops need to keep hive bees, their own success being dependent upon the health of these pollinators? Will nurserymen dealing in plants and seeds for flower gardens find that they must remove from their catalogs the names of plants requiring the service of bumblebees or hawkmoths?

As years go by will members of bird-conservation clubs become distressed because, due to spraying and dusting trees and shrubs in the National Parks and National Monuments, the caterpillar fauna has been depleted until there is not food for nestling birds? Will the associated bird clubs, at some future date, petition the Government to secure and set aside all available waste land, to be maintained under wilderness conditions as *Bird and Insect Preserves?*

And so on and so forth!

After all, does it seem too unlikely that even before the close of the present century, the majority of economic entomologists may be engaged in the protection of insects (excepting a relatively few intolerable pests)? To be sure, Man has wasted other bounties, with resulting punishment, as witness the soil-erosion disasters of the present time. But will not entomologists be too wise to neglect their opportunity to safeguard the welfare of mankind? The fraternity of hive-bee keepers will doubtless continue to fight for the lives of their domestic pollinators. As for other helpful insects, will defenders of equal zeal rally to their support to the end that MANKIND MAY NEVER BE WITHOUT BENEFIT OF INSECTS?

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CHANGE OF NAME IN HYMENOPTERA.—I propose *Heterospilus longicaudatus,* novem nomen, to replace *Heterospilus longicaudus* Ashmead (Journal Linnean Society, Zoology, vol. 25: 119–120, 1894) which is preoccupied by *Caenophanes longicaudus* Ashmead (Canadian Entomologist, vol. 25: 75, 1893), since *Caenophanes* is a direct synonym of *Heterospilus* (Ashmead, "Classification of the Ichneumon Flies," Proc. U. S. N. M., vol. 23: 148, 1900).—Geo E. Nettleton, 2nd, Massachusetts State College, Dept. of Entomology, Amherst, Massachusetts.

ADDITIONS TO AN ANNOTATED LIST OF PENTATOMIDS (HETEROPTERA) OF NEW MEXICO.

By Herbert Ruckes, College of the City of New York,
New York, N. Y.

The accompanying list is an addition to a list previously published in the Bulletin of this Society in February 1937. During the past summer the author again found opportunity to visit Wyoming, Colorado, Arizona and New Mexico. A good deal of collecting was done in the more southern parts of the latter two states, in localities not previously visited. During this trip most species already recorded from New Mexico were taken but in addition new records appeared; it seems advisable to publish these additions to make our knowledge of distribution more complete.

As in the previous article only species actually collected by the author are enumerated and as before new records for the State are marked with an asterisk (*). The number next to each species is that of Van Duzee's 1917 Catalogue of N. A. Hemiptera.

SUBFAMILY PENTATOMINAE.

Tribe Mecidini.

Mecidea longula Stål 80.

This, at one time supposedly uncommon species, may be found in abundance on native and introduced grasses, rather widespread through the state. It appears more commonly toward the south, probably because there are more irrigated and cultivated areas there. It is particularly abundant on side oat grama grass [*Bouteloua curtipendula* (Michx.) Torr.]. On this host it feeds and breeds. I have found all stages of nymphs on this grass though extensive damage to the foliage is not noticeable; where the eggs are laid is not known. Adults seldom fly, even when the grasses are roughly disturbed. The similarity of this species to certain Miridae (*Stenodema* and *Miris*) is striking. In time *M. longula* may become a pest of major proportions; at present, in certain localities where grasses have been allowed to accumulate in old tilled fields, as many as several dozen specimens may be taken in one sweep of the net. Lordsburg, Red Rock, Hidalgo Co., Las Cruces, Dona Ana Co., Sante Fe, Tesuque, Santa Fe Co. June–Sept. Elev. 3000–8000 feet.

Tribe Halyini.

**Brochymena sulcata* Van D. 85a.

This is a very common insect in the vicinity of Las Cruces and in the Gila Valley. Toward the end of July (July 26–31) I found these in abundance on the trunks of honey locust (*Gleditsia triacanthos* Linn.) and red mulberry (*Morus rubra* Linn.); they feed frequently on the younger shoots of the latter. They are reported as feeding also on apple. Males and females were commonly found mating, usually on the trunks of the honey locust where the crevices in the bark afforded some protection. The ground color of the bark and body color of the bugs is much alike. Oviposition was not observed; at the conclusion of mating the couples separated and each went its respective way. Whether or not there is a prolonged interval between the copulatory act and egg laying is not known. In some species there is such an interval. Dr. J. R. Eyer of the State College of New Mexico at Messila Park tells me that this species is commonly found in their orchards and experimental plots; it is frequently found hibernating in the experimental breeding cages and at time becomes a nuisance. During my stay in this locality I took a large number of specimens and could have accumulated thousands if they were so desired. This species appears to replace the common *B. 4-pustulata* (Fab.) of the east but is readily distinguished therefrom by its much lighter color and the grooved genital segment of the male. Dona Ana Co., Hidalgo Co., Bernalillo Co., Santa Fe Co. July–August. Elev. 3000–7000 feet.

B. tenebrosa Walk. 87.

Strictly a Pacific Coast and southwestern species with its easternmost record from Texas. Only two specimens were taken, both from mesquite (*Prosopis velutina* Wooton). Red Rock, Hidalgo Co. July 15. Elev. about 4000 feet.

Tribe Pentatomini.

**Peribalus abbreviatus* (Uhl.) 93.

Much more uncommon than its close relative *P. limbolarius* Stål, but found under similar conditions, *i.e.,* in tall grasses and weeds on moist ranges and in old cultivated farmsteads. It is easily distinguished by its somewhat larger size and its checkered dark and light abdominal edge. Santa Fe Co. Aug. 8th. Elev. 7000 feet.

**Rhytidolomia faceta* (Say) 105.

Only two specimens were taken. This species never appears to be abundant in any locality. They were taken from grasses in open range. It is known that the relatives of this species, such as *R. saucia* (Say) of the east and *R. osborni* Van D. of the west are forms that prefer grasses that grow in salt marshes or alkali flats. The distribution of the species may depend on that factor. Red Rock, Hidalgo Co. July 15–20. Elev. about 4000 feet.

Mormidea tetra Walk. 114.

Swept from a young willow (*Salix* sp.) copse along the banks of the Gila River. The species is not uncommon but is rather local. It is easily distinguished from its relatives by its larger size and arrow-head, black spot on the ventral abdominal wall. Red Rock, Hidalgo Co., July 15th. Elev. about 4000 feet.

Euschistus impictiventris Stål 120.

Very common on alfalfa (*Medicago sativa* Linn.) and other cultivated plants. It has become a cotton pest of major proportions in certain areas. In abundance it shares first place with the common green pentatomid *Thyanta custator* (Fab.) in all cultivated lands. Hidalgo Co., Dona Ana Co., Luna Co. and northward through the Rio Grande valley to about the middle of the state; there it becomes relatively uncommon. July–August. Elev. 3000–5000 feet.

Neottiglossa sulcifrons Stål 147.

Taken in numbers from short, range grasses from Las Cruces westward through Luna Co., Hidalgo Co. to the foothills of the Santa Rita Mts. in Santa Cruz Co., Arizona. Apparently of a more southern distribution than *N. cavifrons* Stål from which it is distinguished by its smaller size and darker hue. July 15–30. Elev. 3000–5000 feet.

**Cosmopepla bimaculata* (Thom.) 149.

This common eastern species occurs much less abundantly through the southwest. In the several years collecting in that region only a few individuals have been taken. These have all come from grasses in old cultivated plots around Las Cruces and more northern Santa Fe. What restricts the abundance of certain species in areas that appear to be ideal for their occurrence and seem to duplicate, in all respects, habitats where they are commonly found is still a puzzle that entomologists have to solve. Dona Ana Co.; Santa Fe Co. July–August. Elev. 4000–7000 feet.

**Cosmopepla binotata* Dist. 152.

This, the most beautiful species of the genus, is found abundantly locally at relatively high altitudes. The series taken this season were collected in the Sandia Mountains, north of Albuquerque at an elevation between 8500 and 9000 feet. The food plant appears to be *Penstemon fendleri* Gray, as all the specimens were taken from such plants. Aug. 3rd. Bernalillo Co. Elev. 8000–9000 feet.

**Thyanta punctiventris* Van D. 164.

This easily recognized species occurs with *T. custator* (Fab.) in alfalfa fields, in waste meadows and on old stands of Swiss chard. Its spotted appearance readily distinguishes it from the more northern *T. rugulosa* (Say). It is not common although it may be occasionally so locally. July–August, Las Cruces, Dona Ana Co. Elev. about 3000–4000 feet.

Dendrocoris contaminatus Uhl. 199.

This species is frequently taken when beating Gambel's oak (*Quercus gambeli* Nutt.). I have collected it in the Sandia Mountains as well as in the canyons about Santa Fe and northward into Colorado. Sandia Mts., Bernalillo, Co., Tesuque Canyon, Santa Fe Co. Elev. 6000–8000 feet.

SUBFAMILY ASOPINAE.

**Apateticus crocatus* (Uhl) 226.

This appears to be the southwestern representative of *A. cynicus* (Say). It is found rather abundantly on Gambel's oak (*Q. gambeli* Nutt.) and often appears in company with *Dendrocoris contaminatus* Uhl.; at least I have taken it more frequently that way than by itself. Canyons about Santa Fe and in the higher parts of the Sandia Mts. in Bernalillo Co. Aug. 3–5. Elev. 6000–8000 feet.

**Podisus acutissimus* Stål 234.

The most colorful and smallest species of this genus. Uncommon and local; decidedly of more southern range. It is much more common in Arizona and over the Mexican border than it is in New Mexico. All specimens collected were taken from the tall grass *Holcus halepensis* Linn. Las Cruces, Dona Ana Co., Lordsburg and Red Rock, Hidalgo Co. Elev. about 3000–4000 feet. July–August.

Notice.—Title page and index for vol. 32 are bound in with the December number, 1937.

NOTES ON THE BIOLOGY OF *PSEUDOMETHOCA FRIGIDA* (SMITH) (HYMENOPTERA, MUTILLIDAE).

By Karl V. Krombein, Buffalo, New York.

So little is known of the biology and host relationships of our North American Mutillids that I am publishing these few observations which were made in the pine barren region southeast of Smithtown, Long Island, New York, on July 25, 1937.

My attention was drawn to two small insects wrestling on the sand in what I believed to be a copulatory embrace. Closer observation revealed that a female bee, *Halictus* (*Chloralictus*) *zephyrus* Smith,[1] was trying to decapitate a female *Pseudomethoca frigida* (Smith). The Mutillid made no attempt to defend herself and so far as I could see the bee did not try to use her sting. After several moments of this treatment the bee flew off and I placed the Mutillid at the opening of a burrow a few inches away which was guarded by another female *Halictus zephyrus*. During the preceding fracas this second bee had remained in the burrow with only her head protruding. Now she turned around in the burrow presenting the tip of her abdomen to the wasp. The *Pseudomethoca* tried to dig past her to get into the burrow and failing in that attempted to drag the bee out bodily also without success. At this point the second bee returned and dragging the wasp several inches away began to maltreat it again. After this second mauling the wasp was so weak I placed all three insects in the killing jar for subsequent determination.

The burrow was then excavated and found to be a tortuous affair some four inches long and ending about two inches below the ground level. So far as I could determine no cells had been constructed by the joint owners of the burrow nor were there any signs of intrusion by Mutillids.

The behavior of the wasp gives rise to several questions which almost imply aberrant behavior on the wasp's part. Why did the wasp so passively accept the bee's mauling? Even in these tiny Mutillids the sting is quite a potent weapon and must have made some impression on the bee if it had been used. Secondly, is it possible that the egg of the parasitic wasp is deposited in the host's burrow before the host has stocked the cells and laid her own eggs?

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[1] Miss Grace Sandhouse, of the United States National Museum, has been kind enough to identify the two bees.

Melander and Brues[2] record similar observations on battles between *Halictus* (*Chloralictus*) *pruinosus* Robertson and the same species of *Pseudomethoca* (recorded by them as *Mutilla canadensis* Blake). However, they state that the Mutillid fights back occasionally killing the bee. They do not say whether the Mutillid's egg is laid in the bee's nest before or after it is provisioned.

REDUCED RATES AND TOURS TO EUROPE.

On account of the Seventh International Entomological Congress at Berlin, August 15 to 20, 1938.

Special reduced steamship rates will be in effect for those booking under the committee's arrangements.

The following tour will be organized, if enough book, for those wishing to tour Europe before or after the Congress or both.

Sailing June 25, six day motorcoach tour through Ireland, one week motorcoach tour through England, nine days in London and northeastern England (Scotland optional) Norwegian fjords and glaciers, Oslo three to five days, Copenhagen, North Central Germany. After the Congress: Breslau, Krakau, Budapest, Vienna, the Danube, four days at an Austrian Alpine Lake, Munich, Switzerland, (Riga, Lake Lucerne, Pilatus, Jungfrau), Paris. Sailing from Cherbourg September 18.

If you or your friends have any interest in the tour, send in your name and you will be kept informed. No general announcement will be mailed to the membership list.

Joint Committee of Entomological Society of America
and American Association of Economic Entomologists.

A. R. Shadle, University of Buffalo,
Chairman
R. W. Leiby, Cornell University

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[2] Melander, A. L., and C. T. Brues. Biol. Bull., V: 4–7, fig. 4, 1903.

THE STRUCTURES CALLED PARAMERES IN MALE INSECTS.

By G. C. Crampton, Massachusetts State College,
Amherst, Mass.

Handlirsch and other recent investigators who have figured the genitalia of male Thysanuroid Apterygotan insects, apply the term "parameres" to the processes labelled *am,* on each side of the aedeagus, labelled *ae* in Fig. 7 of the Thysanuroid insect *Machilis.* The structures labelled *am* in Fig. 7 of *Machilis,* however, are processes (sometimes interpreted as endopodites) of the coxites *cx,* or basal segments of the gonopods of the ninth abdominal segment, and thus differ from the true parameres of higher insects, in which the parameres arise as lateral derivatives of a pair of lobes borne on the ninth abdominal segment, during the development of such higher insects as the Coleoptera. On this account, the processes *am* of the coxites *cx* of such Apterygota as *Machilis* (shown in Fig. 7) may be designated as *andromeres,* to distinguish them from the true parameres of higher insects, which are described later.

Verhoeff, and other students of the Dermaptera, apply the designation "parameres" to the structures labelled *pa* in Fig. 2, which are lateral processes of the slender paired penes *pe* (borne on a common apodeme labelled *pf*) in such Dermaptera as *Anisolabis,* shown in Fig. 2. Unless the structures labelled *pa* in Fig. 2 are homologous with similarly located structures borne on each side of the paired penes of male Ephemerida, they are peculiar to the Dermaptera alone (and the Dermaptera differ from the bulk of their Orthopteroid relatives in the nature of the male genitalia). Since the structures labelled *pa* in Fig. 2 of the Dermapteron *Anisolabis* are not strictly homologous with the true parameres of higher insects, they may be called *parandrites,* to distinguish them from the true parameres, which arise as lateral derivatives of a pair of lobes borne on the ninth sternite during the development of male Coleoptera.

In such Coleoptera as the one shown in Fig. 8, a prong-like paramere, bearing the label *pm,* occurs on each side of the aedeagus, labelled *ae* in Fig. 8; and these parameres are said to arise as lateral derivatives of a pair of lobes borne on the ninth sternite in developing Coleoptera. Verhoeff and others have likewise applied the designation parameres to these structures in male Coleoptera (*i.e.,* the structures bearing the labels *pm* and *h* in Fig. 8), and it is here suggested that the term parameres be restricted to these structures and the parts strictly homologous with them in other male insects.

The parameres of male Coleoptera are not forcipate, so that the Coleoptera are set off from the "forcipate" series of Holometabola by this feature. In fact the Coleoptera are rather isolated Holometabola which have retained more Protorthopteroid (or Dermapteroid) features than most of the other members of the Holometabolous group.

The ninth sternite, or hypandrium, *ha,* is rather normally developed in the Coleopteron shown in Fig. 8 (although the hypandrium shows some indications of becoming lateroverted, or shifted up into the insect's left side), but in many other Coleoptera the ninth sternite becomes slender and tongue-like and the male genitalia undergo considerable shifting about.

The proctiger, or anus-bearing segmental complex labelled *pg* in Fig. 8, apparently contains the tenth segment, with which the eleventh segment and the anus-bearing nonsegmental telson have united—unless these structures have become atrophied instead of uniting with the tenth segment. Due to a slight torsion, or shifting of the parts below it, the proctiger, *pg,* appears to be somewhat displaced over toward the insect's left side in the Coleopteron shown in Fig. 8.

The claspers in the males of such Hymenoptera as the ants have long been homologized with parameres by Emery, Wheeler, and other students of the Formicidae; and other investigators have recently homologized the genital forceps of male sawflies with the parameres of male Coleoptera, but no one has apparently followed this idea to its logical conclusion and homologized the parameres of male Hymenoptera with the genital forceps of other Holometabola belonging to the "forcipate" series (*i.e.,* the Mecoptera, Trichoptera, Diptera, etc.), since the segments of the genital forceps are usually interpreted as coxites and styli of the gonopods of the ninth abdominal segment in the other members of the "forcipate" series. In the present paper, however, the forcipate claspers of the rest of the series of Holometabola are likewise homologized with the parameres of male Coleoptera, since the forceps of all of these Holometabola are homologous with the forceps of the Hymenoptera, and if the latter are really homologous with the parameres of male Coleoptera (as is claimed by all recent investigators), then the forceps should be interpreted as parameres throughout the entire series of "forcipate" Holometabola.

The parameres of a typical male sawfly, such as the one shown in Fig. 6, are composed of a basal ring, *gc* (sometimes called the gonocardo), a shaft region, *gs* (sometimes called the gonostipes), and a distal clasper, or harpago, *h* (also called the harpe, cochliarium, etc.). In the primitive sawfly *Xyela,* shown in Fig. 6, the basal ring, *gc,* is notched and its halves are still closely associated with the bases of the shafts, *gs,* thus suggesting that the basal ring may have arisen through the union of detached basal portions of the shafts. The shafts, *gs* of Fig. 6, or *hg* of Fig. 3, are secondarily demarked into smaller areas; and the claspers, *h,* are divided into two parts in the sawfly *Xyela* shown in these figures.

The aedeagus, *ae,* is composed of two penis valves in such sawflies as *Xyela* (Fig. 6) and this suggests that the aedeagus of higher forms may have arisen from the union of paired structures of this type. The so-called sagittae and volsellae of higher Hymenoptera may represent detached portions of the shafts of the genital forceps (or they may have arisen independently in the areas near the base of the aedeagus) but the homologies of these structures, and their mode of origin throughout the order Hymenoptera, have not been definitely determined.

In the sawfly *Xyela* shown in Fig. 3 the ninth tergite, or epandrium, *9t,* is much reduced, but the ninth sternite, or hypandrium, *9s,* is well developed, as is also the case in most male sawflies. The proctiger, or anus-bearing segmental complex, labelled *pg* in Fig. 3, apparently represents the tenth segment, with which the cercus-bearing eleventh segment and the anus-bearing telon have apparently united—unless these structures become atrophied instead of uniting with the tenth segment.

The structures labelled *c* in such sawflies as *Xyela,* shown in Fig. 3, are here interpreted as the cerci, although some recent investigators consider that they represent appendages of the tenth segment, called socii. Similar structures in female Mecoptera, however, are interpreted as cerci and it is very probable that these structures represent cerci in the Hymenoptera also.

In male Mecoptera, such as the one shown in Fig. 1, the genital forceps are composed of a basal segment, or harpagoger, *hg,* and a distal segment, or harpago, *h* (also called the harpé), forming the clasper proper. Most of the recent investigators who have figured the parts in male Mecoptera consider that the harpagoger, *hg,* and harpago, *h,* represent the coxite (or coxopodite) and stylus of the gonopods of the ninth segment and the writer likewise interpreted the parts in question as segments of the styli of the gonopods of the ninth segment, in former papers. If the genital forceps of male Hymenoptera really represent parameres, however, then the genital forceps of male Mecoptera also represent parameres, since the structures in question are clearly homologous in both groups of insects and are so interpreted in the present paper.

The distal segments, or harpagones, of the genital forceps are reduced in such Mecoptera as *Bittacus,* in which the aedeagus becomes long and coiled, resembling in this respect the aedeagus of certain higher Diptera. The valves which occur near the base of the aedeagus in many Panorpids, have been figured elsewhere, and need not be further considered here.

The ninth tergite, or epandrium, *ea,* is well developed in the Mecopteron shown in Fig. 1, and the hypandrium, or ninth sternite, *ha,* is typically large and well developed in male Mecoptera, and frequently bears distinctive processes, etc., of value for determining the species of these insects.

The proctiger, *pg,* apparently represents the tenth segment, with which the cercus-bearing eleventh segment and anus-bearing telson have united—or they have become atrophied, if they did not unite with the tenth segment. The cerci, *c,* of Fig. 1, are reduced in male Mecoptera, although they are usually two-segmented, and are borne on a distinct eleventh segment in female Mecoptera.

In the males of certain Trichoptera, such as the one shown in Fig. 5, the genital forceps are composed of two segments, which are labelled *hg* and *h* in Fig. 5. The basal segment labelled *hg* in Fig. 5, evidently corresponds to the basal segment, or harpagoger, *hg,* of the genital forceps of the male Mecopteron shown in Fig. 1, and the distal segment, labelled *h,* in Fig. 5, evidently corresponds to the distal segment, or harpago, *h,* of the forceps of the male Mecopteron shown in Fig. 1; and if the genital forceps of the male Mecopteron shown in Fig. 1 (and the sawfly shown in Fig. 3) are parameres, then the genital forceps of the male Trichopteron shown in Fig. 5 must also be regarded as forcipate parameres.

The ninth tergite, or epandrium *ea,* is quite well developed in the male Trichopteron shown in Fig. 5, but the hypandrium, or ninth sternite, *ha,* does not project posteriorly to any extent in most Trichoptera, as it does in the male Mecoptera, sawflies, etc., shown in Figs. 1, 3, etc.

In many primitive Diptera belonging to the suborders Nematocera and Orthorrhapha Brachycera, the genital forceps of the male are composed of two segments, as is the case in the male Rhagionid (Leptid) shown in Fig. 9. The basal segment, *hg,* of the genital forceps of the Dipteron shown in Fig. 9, evidently corresponds to the basal segment, or harpagoger *hg,* of the forceps of the male

Mecopteron shown in Fig. 1, and the distal segment, *h,* of the genital forceps of the Dipteron shown in Fig. 9 evidently corresponds to the distal segment, or harpago, *h,* of the male Mecopteron shown in Fig. 1; and the genital forceps of these insects are evidently homologous with the structures interpreted as forcipate parameres in male sawflies and other Hymenoptera, although the decision as to whether the genital forceps of male Diptera, etc., represent forcipate parameres, or not, depends upon the correct identification of the genital forceps of male Hymenoptera as forcipate parameres.

Snodgrass, and other investigators who accept de Meijere's interpretation of the genital forceps of male Diptera as modified gonopods of the ninth abdominal segment, regard the basal and distal segments of the forceps as the coxites (or coxopodites) and styli of the gonopods in these insects; and the writer formerly interpreted the segments of the genital forceps as parts of the styli of the gonopods of the ninth segment and designated the basal segment of the forceps as the basistyle, and the distal segment as the dististyle, in male Diptera. In the present paper, however, the genital forceps of male Diptera (and other "forcipate" Holometabola) are interpreted as forcipate parameres simply because the evidence is inescapable that the genital forceps of these insects are homologous with the genital forceps of male sawflies and other Hymenoptera (whatever these may be), and if recent investigators are correct in identifying the genital forceps of male Hymenoptera with the parameres of male Coleoptera, there seems nothing left to do but follow this hypothesis to its logical conclusion and interpret the genital forceps of the Diptera and the rest of the "forcipate" Holometabola, also, as forcipate parameres. It must be admitted, however, that the evidence thus far produced by those who maintain that the genital forceps of male Hymenoptera represent the parameres of male Coleoptera is not entirely satisfactory, but since this view is accepted by all recent investigators, it may be used as a "working hypothesis" in attempting to homologize the parts of the genital forceps in the Holometabolous series, and for this purpose it is accepted, provisionally, in the present paper.

The ninth tergite, or epandrium, *ea,* is retained as a distinct plate in the male Rhagionid (Leptid) shown in Fig. 9, and the ninth sternite, or hypandrium, *ha,* is still distinct from the basal segments of the forceps in this rather highly specialized Dipteron, although in the males of certain Tipulidae, Mycetophilidae, and other representatives of the primitive suborder Nematocera, the basal segments of the genital forceps frequently tend to unite with the ninth sternite.

The structures labelled *c* are interpreted as the cerci in the Dipteron shown in Fig. 9, although some investigators regard these structures as socii, or appendages of the tenth segment in the Diptera. The structures in question, however, are composed of two segments in female Stratiomyidae, certain Mycetophilidae, etc., and are evidently homologous with the structures interpreted as cerci in female Mecoptera, etc., and on this account the structures in question are interpreted as cerci in the male Diptera here described.

It is extremely difficult to interpret the parts of the genitalia of male Cyclorrhaphous Diptera in terms of the parts of the genitalia of male Nematocera and Orthorrhapha Brachycera, so that the interpretations here suggested for the parts in the males of the higher Cyclorrhapha, such as *Phormia regina,* shown in Fig. 4, must be regarded as purely tentative, although these interpretations are based upon the study of an extensive series of Diptera which are not figured here and the conclusions here expressed are not based upon a direct comparison of the highly specialized *Phormia* with the rather primitive Rhagionid (Leptid) shown in Fig. 9, but are suggested by the condition found in male Syrphidae and other forms intermediate between these two widely separated types of Diptera.

The paired, so-called posterior gonapophyses, labelled *b* in Fig. 4 of *Phormia* (only one of these is shown in the lateral view of *Phormia*), are here interpreted as the distal segments, or harpagones, *h,* of the forcipate parameres of the male Rhagionid (Leptid) shown in Fig. 9, and the paired, so-called anterior gonapophyses, labelled *a* in Fig. 4 of *Phormia,* are here regarded as representing at least a part of the basal segments of the forcipate parameres, labelled *hg* in the male Rhagionid shown in Fig. 9. It is possible that a portion of the basal segment of the forcipate parameres has united with the ninth tergite, labelled *9s* in Fig. 4 of *Phormia,* but this does not alter the fact that the structures labelled *a* and *b* in *Phormia* (Fig. 4) appear to correspond, in a general way, to the basal and distal segments of the forcipate parameres bearing the labels *hg* and *h* in the Rhagionid shown in Fig. 9. The reasons for adopting this view will be presented elsewhere since it is necessary to include the figures of male Syrphidae and other intermediate forms to illustrate the stages in the transformation of the segments of the genital forceps into the anterior and posterior gonapophyses of the higher Cyclorrhapha.

The structures labelled *ss* in Fig. 4 of *Phormia* are here interpreted as appendages of the ninth tergite, called surstyli in other insects; and the structures labelled *c* in Fig. 4 of *Phormia* are here interpreted as cerci—as is also done by other students of the Cyclorrhapha, although Snodgrass considers that these structures are lateral lobes of the tenth tergite. The proctiger, *pg,* of *Phormia* probably represents the tenth segment, with which the cercus-bearing eleventh segment (and anus-bearing telson) have united, unless the latter becomes atrophied instead of uniting with the tenth segment.

The evidence for considering that the plate bearing the label 7 + 8 in Fig. 4 of *Phormia* represents the lateroverted seventh sternite and inverted eighth sternite (instead of the eighth tergite alone) has been briefly presented in other articles dealing with this subject, but a more detailed consideration of the evidence upon which this interpretation was based can be more profitably discussed elsewhere, since it is the purpose of this preliminary paper merely to set forth the view that if the genital forceps of male Hymenoptera are actually homologous with the parameres of male Coleoptera then the genital forceps of male Diptera and other members of the "forcipate" series of Holometabolous insects must also be regarded as forcipate parameres.

ABBREVIATIONS.

a	Anterior gonapophyses, or harpagogers
ae	Aedeagus
am	Andromeres
b	Posterior gonapophyses, or harpagones
c	Cerci
cx	Coxites (coxopodites)
d	Genital spine
ea	Epandrium, or ninth sternite
gc	Gonocardo, or basal ring of forceps
gs	Gonostipes, or shaft of forceps
h	Harpago or distal segment of forceps
ha	Hypandrium, or ninth sternite
hg	Harpagoger, or basal segment of forceps
pa	Parandrites
pe	Paired penes
pf	Penifer, or penis-bearing apodeme
pm	Parameres
pp	Paraprocts
s	Sternite (segment indicated by numeral)
ss	Surstyle
st	Styli
t	Tergite (segment indicated by numeral)

EXPLANATION OF PLATE I.

FIG. 1. Lateral view of terminalia of a Mecopteron, *Taeniochorista.*

FIG. 2. Ventral view of genitalia and terminal structures of a Dermapteron, *Anisolabis maritima.*

FIG. 3. Lateral view of terminalia of a sawfly, *Xyela* sp.

FIG. 4. Lateral view of terminalia of a Cyclorrhaphous Dipteron, *Phormia regina.*

FIG. 5. Lateral view of terminalia of a Trichopteron.

FIG. 6. Ventral view of genital forceps of *Xyela* sp.

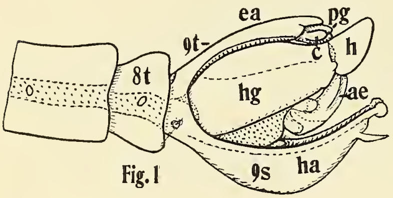
FIG. 7. Ventral view of ninth segment and its appendages in a Thysanuroid insect, *Machilis variabilis,* redrawn from Snodgrass, 1935.

FIG. 8. Lateral view of terminalia of a Lampyroid Coleopteron.

FIG. 9. Lateral view of terminalia of a Rhagionid (Leptid) Dipteron, *Rhagio* sp.

Collecting at Lakehurst, N. J., around Christmas, 1936.—In the past winter of 1935–36 the weather here in Lakehurst was cold from December 10 to March 10.

This winter (1936–1937) so far conditions were altogether different. On December 25 and 26 a few *Conistra* and *Graptolitha* were attracted to bait. The weather was clear and moderate. On December 27 it was cloudy and quite warm—around 62° in the day time and hardly less than 52 after dark. The result in securing specimens was remarkable. Some trees had as many as a dozen specimens, mostly *Conistra* and *Plathypena scabra* Fabr., even two *Glaea viatica* Grt. and *pastillicans* Grt., a few *Peridroma saucia* Hbn. and eleven different species of *Graptolitha,* including *lemmeri* B. & Benj. and *viridipallens* Grt. Some of the latter two species bleeding, *i.e.,* perfectly fresh when pinned. There were also several Micro-Lepidoptera, quite a few ants and some other insects at the bait.—FREDERICK LEMMER.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ae
9s
ha

Fig. 1

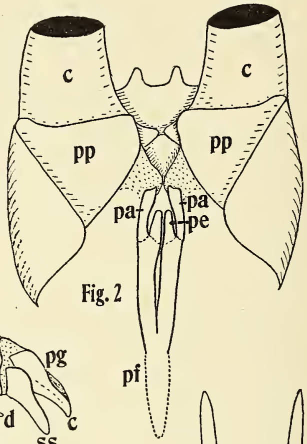
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Fig. 2

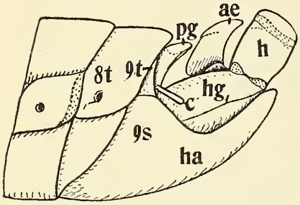
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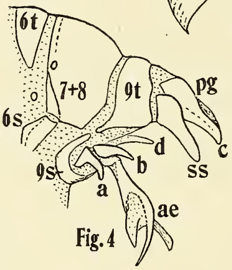
Fig. 3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b
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Fig. 4

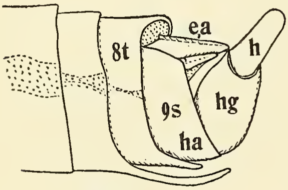
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Fig. 5

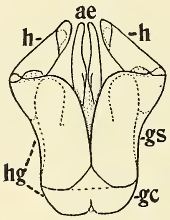
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Fig. 6

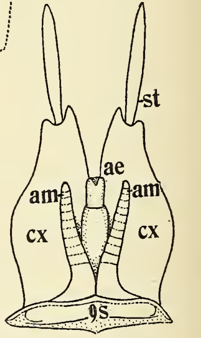
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Fig. 7

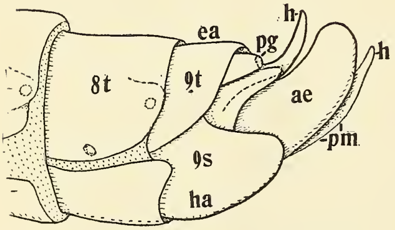
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Fig. 8

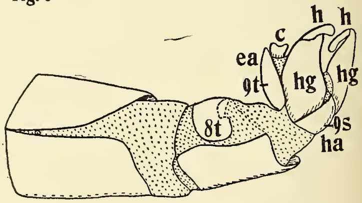
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Fig. 9

COLLECTING HELIOTHINAE (LEPIDOPTERA) ALONG THE SOUTH CAROLINA SEA-BOARD AND ADJOINING AREAS.

ROWLAND R. McELVARE, Port Washington, L. I., N. Y.

Although there are a number of records of Heliothinae (Barnes and McDunnough List Nos. 1052–1218) from the southeastern United States, a check of all the material in this group at the U. S. National Museum about a year ago showed only three species from South Carolina. These were *Heliothis obsoleta* Fabr., *Lygranthoecia siren* Streck. and *Schinia trifascia* Hübn.

A few notes are presented here and a list of seventeen species of Heliothinae taken in the course of a two week trip in the South in search of them during mid-September, 1937, in company with Mr. George P. Engelhardt. Included in the list are fifteen species found in South Carolina, among them *Eupanychis scissoides* Benj. Of this species, Mr. J. F. Gates Clarke states that the National Museum Collection has only the male type and the female paratype, which were collected in Florida.

Throughout the trip the weather was generally clear with the exception of a rainy morning in Charleston, S. C. The days were warm and usually sunny, the nights mild. Toward the end of September, however, a few of them were quite cool.

At Southern Pines, North Carolina, the first stop for collecting, no moths appeared during the evening at the exterior lights on buildings. The next morning under a warm sun, collecting in open meadows turned up *Heliothis paradoxa* Grt., *Schinia trifascia* Hübn., *S. lynx* Guen., and *S. sordida* Sm. These were usually found sitting in the heads of field flowers or, when startled, in flights of ten to twenty yards at the high speed characteristic of these moths. Only *sordida* Sm. was present in any quantity and the poor condition of most of the material taken suggested that the season for them at Southern Pines was well advanced.

Crossing into South Carolina, we made an overnight stop at Pocalla Springs near Sumter. Several *sordida* were captured at lights together with a specimen each of *Lygranthoecia tuberculum* Hübn. and *Schinia saturata* Grt. The notable feature, however, was the large numbers of *Lygranthoecia ultima* Streck. Although there were many electric lights on the buildings and along the walks at Pocalla Springs and a powerful neon sign at the highway, practically all these moths clustered around three or four adjacent building lights. To the human eye these lights appeared no different in character and location from many other lights in the vicinity, all of which were bare of moths. In the morning a careful examination of the surrounding sunny and flower covered fields did not disclose a single specimen of *ultima,* which had been so abundant at lights the previous evening.

Outside of Savannah, Georgia, conditions appeared favorable but collecting was poor, somewhat better results being obtained further south among the sand dunes at Sea Island Beach on St. Simon Island off Brunswick, Georgia, where daylight collecting added one *Lygranthoecia siren* Streck. to our list. Returning to South Carolina, daylight collecting at Beaufort included *Schinia sanguinea* Geyer. in the catch. Further collecting among the pines along the road north of Georgetown netted *Heliothis virescens* Fabr. and *Lygranthoecia bimatris* Harv.

The high point of the trip was reached at Myrtle Beach, a stretch of pine barrens on the South Carolina coast, which yielded fourteen species of Heliothinae in one night and a morning. Most of these were found at lights on a building located in a partly cleared pine section about a half mile back from the ocean. Not far from it was a small stream. Except for *S. trifascia* Hübn. which seemed equally common both at lights, and on yellow aster by day, the representation in each of the various species present was small. It was at Myrtle Beach that *Eupanychis scissoides* Benj. occurred. Curiously enough, *S. sordida* Sm., which was found at practically every other spot where we collected, did not appear at Myrtle Beach.

Following these results, a final stop was made outside New Bern, North Carolina, on the way north. Here a large gasoline light was set up, shining on a white sheet. In the course of several hours the only thing collected was the dew. No insect of any kind appeared. There was a full moon but it did not rise until late and Heliothinae usually come to lights within an hour after dark. The complete lack of results here was probably due to the low temperature that evening.

In the list the numbers preceding the different species are those in the Barnes and McDunnough Check List. The relative frequency of the different species is indicated by the numbers after the respective localities, showing how many specimens were actually captured.

1087 *Heliothis paradoxa* Grt. North Carolina—Southern Pines (3).

1090 *Heliothis obsoleta* Fabr. South Carolina—Myrtle Beach (1). Georgia—Sea Island Beach (1).

1091 *Heliothis virescens* Fabr. South Carolina—Myrtle Beach (1); Georgetown (3).

1110 *Lygranthoecia bimatris* Harv. South Carolina—Myrtle Beach (2); Georgetown (1).

1111 *Lygranthoecia carolinensis* B. & McD. South Carolina—Myrtle Beach (1).

1112 *Lygranthoecia concinna* Sm. South Carolina—Myrtle Beach (1).

1118 *Lygranthoecia siren* Streck. Georgia—Sea Island Beach (1).

1119 *Lygranthoecia tuberculum* Hübn. South Carolina—Myrtle Beach (1); Pocalla Springs (Sumter) (1).

1128 *Lygranthoecia ultima* Streck. South Carolina—Myrtle Beach (3); Pocalla Springs (Sumter) (102); Beaufort (1). Georgia—Sea Island Beach (2).

1152 *Schinia trifascia* Hübn. North Carolina—Southern Pines (2). South Carolina—Myrtle Beach (47); Georgetown (1); Beaufort (1). Georgia—Savannah (1).

1180 *Schinia lynx* Guen. North Carolina—Southern Pines (1). South Carolina—Myrtle Beach (1); Ladies Island (Beaufort) (3).

1181 *Schinia sordida* Sm. North Carolina—Southern Pines (49). South Carolina—Pocalla Springs (Sumter) (6); Beaufort (11); Ladies Island (Beaufort) (5); Georgetown (1). Georgia—Savannah (1); Sea Island Beach (1).

1182 *Schinia petulans* Hy. Edw. South Carolina—Myrtle Beach (5).

1187 *Schinia gloriosa* Streck. South Carolina—Myrtle Beach (1).

1188 *Schinia sanguinea* Geyer. South Carolina—Myrtle Beach (1); Beaufort (1).

1189 *Schinia saturata* Grt. South Carolina—Myrtle Beach (3); Pocalla Springs (Sumter) (1); Beaufort (3). Georgia—Sea Island Beach (1).

—— *Eupanychis scissoides* Benj. South Carolina—Myrtle Beach (2).

NINE NEW AMERICAN TINGITIDAE (HEMIPTERA).

C. J. Drake and M. E. Poor, Iowa State College,
Ames, Iowa.

The writers have received from various collectors in South America and Central America numerous specimens of Tingitidae, nine species of which are described below as new to science. The types are in the Drake collection.

1. **Monanthia haitiensis,** sp. nov.

Head blackish, clothed with pale, recumbent pubescence, with five brownish spines, the median very short, the others moderately long. Antennae moderately long, segment I reddish brown, stouter and a little longer than II; II reddish brown; III testaceous, twice as long as IV; IV fuscous, clavate. Rostrum reaching beyond middle of mesosternum. Legs rather short and stout; coxae, trochanters and femora reddish brown; tibiae testaceous; tarsi mostly fuscous.

Pronotum convex, coarsely pitted, with whitish pubescence, blackish on disc, tricarinate, lateral carinae short, parallel; median carina sharply raised, indistinctly reticulate, testaceous. Collar testaceous anteriorly, not very prominent, slightly notched at middle in front. Paranota moderately broad, resting upon surface of pronotum, a little broader than in *loricata,* testaceous, fuscous on humeri. Elytra brownish, the nervures along costal margin mostly testaceous; costal area moderately broad, uniseriate, the areolae mostly quadrate and large; subcostal area broad, finely reticulate; discoidal area broad, the outer apical margin broadly bowed, strongly raised, infuscate, and extending considerably into subcostal area; nervures moderately clothed with fine, recumbent pubescence.

Length, 2.80 mm.; width, 1.20 mm.

Holotype, female, allotype, male, and four paratypes, Port au Prince, Haiti. Most closely allied to *M. loricata* Distant but easily separated from it by the paranota and discoidal area.

2. **Monanthia ainsliei,** sp. nov. (Fig. 1.)

Testaceous, slightly marked with fuscous. Head reddish brown with five rather short, blunt spines, the median shortest. Rostrum not quite reaching metasternum, rostral laminae widely separated and chordate on metasternum, testaceous. Bucculae broad, brownish, contiguous in front. Body beneath

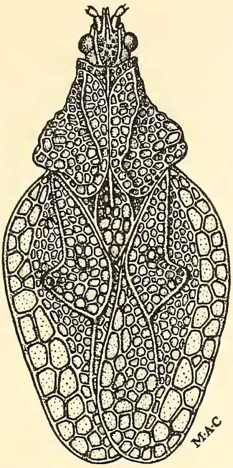

FIG. 1. **Monanthia ainsliei,** sp. nov. (type).

brown; legs slender, testaceous; tarsi fuscous. Pronotum strongly narrowed anteriorly with broad, prominent humeri; collar broadly and deeply notched in front, the median portion narrowly and sharply raised. Paranota very broad resting upon and concealing almost all the dorsal surface of pronotum, contiguous along median portion, inflated at humeri and with a raised ridge within; triangular process small, pointed at apex, reticulate; lateral carinae visible only on triangular process, strongly curved inward anteriorly; the median carina becoming obsolete posteriorly. Elytra broadest near base; costal area broad, biseriate, the areolae large and hyaline; subcostal area much more finely reticulate, broad, four areolae deep in widest part; discoidal area beyond middle with sinuate outer margin projecting deeply into subcostal area (see fig. 1), there sharply raised and infuscate.

Length, 2.60 mm.; width, 1.45 mm.

Holotype, female, Concepcion, Guatemala, elevation 1400 ft., collected by C. N. Ainslie, for whom the insect was named.

Readily separated from all American members of the genus by the more broadly expanded elytra, broader and more widely reticulate costal area, excavated median anterior portion of collar and shape of paranota and discoidal area.

3. **Corycera rhopalae,** sp. nov.

Head black, strongly convex above, with five long, stout, blunt, testaceous spines. Eyes reddish to black. Bucculae broad, brownish, contiguous in front. Rostrum brown, dark at tip, extending to base of mesosternum; rostral laminae blackish, widely separated, composed of one row of small areolae. Legs long, slender, testaceous, the tarsi dark. Antennae slender, testaceous, the basal and apical three-fourths of last segment black; segment I stouter than and nearly two and one-half times as long as II; III twice as long as IV. Body beneath black.

Pronotum rugose, strongly convex above, tricarinate, brownish, the collar and triangular process whitish; calli black; lateral carinae distinct but becoming almost obsolete in front, parallel; median carina distinct, non-areolate, sharply raised so as to form a prominent point at the middle of disc; paranota indistinct except opposite calli, there very narrow. Elytra constricted beyond middle; costal area extremely narrow, the areolae distinct only beyond middle; subcostal area moderately broad, mostly biseriate, triseriate in widest part; discoidal area extending to middle of elytra, widest beyond middle, there three areolae deep.

Length, 3.00 mm.; width, 1.00 mm.

Holotype, male, allotype, female, and six paratypes, Belo Horizonte, Minas Gerães, Brazil, on *Rhopala* sp. The raised point on median carina distinguishes this species from its congeners.

4. **Corycera panamensis**, sp. nov.

Head black, moderately convex, with five rather long, moderately stout, yellowish brown spines. Rostrum yellowish, reaching to base of mesosternum. Legs slender, testaceous, the tarsi dark, antennae missing. Pronotum dark yellowish brown, shiny, coarsely pitted; lateral carinae distinct behind, obsolete on disc and in front; paranota narrow, testaceous, uniseriate opposite humeri, wider and biseriate in front, the areolae hyaline. Elytra brownish black; costal area testaceous, broad, mostly biseriate, triseriate in widest part, the areolae hyaline; subcostal area broad, mostly triseriate, five areolae deep at apex of discoidal area, the areolae small; discoidal area reaching middle of elytra, slightly raised at apex, widest beyond middle, there five or six areolae deep. Collar triangularly raised in the middle so as to form a small hoodlike structure.

Length, 3.00 mm.; width, 1.20 mm.

Holotype, female, Canal Zone, Panama. Allied to *C. machaeri* Drake and Hambleton but easily separated from it by the more slender spines on head, the obsolete lateral carinae in front and larger size.

5. **Acysta myrocarpi**, sp. nov.

Obovate, moderately large, costal area without transverse fascia. Head black, with five pale spines, median and anterior pair very short, and posterior pair appressed, reaching to anterior margin of eye. Antennae smooth, slender, testaceous, apical segment mostly black; segment I rather short, slightly stouter than and not twice as long as II; III straight, less than twice the length of IV. Rostral channel strongly widening posteriorly, the laminae testaceous, not strongly foliaceous; rostrum short, testaceous, black at tip, reaching a little beyond prosternum. Pronotum mostly brownish fuscous, convex, pitted, tricarinate; carinae distinct but not reticulate, the median faintly more elevated, lateral carinae faintly bowed outward on disc, calli impressed, black. Collar distinct, slightly raised at middle. Paranota very narrow, testaceous, uniseriate, widest opposite calli.

Elytra broad; costal area broad, mostly biseriate, triseriate in widest part, testaceous, areolae hyaline; subcostal area brownish, triseriate in widest part; discoidal area not reaching middle of elytra, five areolae deep in widest part, the distal three-fourths fuscous, extending into the subcostal area; sutural area testaceous, the nervures and areolae along median portion infuscate (widening into transverse band at widest point).

Length, 2.5 mm.; width, 1.2 mm.

Holotype, male, allotype, female, and two paratypes, Belo Horizonte, Brazil.

6. **Pachycysta hambletoni**, sp. nov.

Readily separated from *P. championi* Drake and *P. schildi* Drake by the much shorter antennae and angulately raised median carina in front; from *P. diaphana* Champion by the narrower costal area, and much wider apex of discoidal area. Dark ferrugineous, the areolae mostly hyaline. Antennae densely clothed with recumbent pilose hairs, dark ferrugineous; segment I short, slightly stouter and slightly longer than II; III comparatively short, twice as long as IV; IV blackish, slender, faintly enlarged toward apex, clothed with numerous short pale hairs interspersed with longer, dark bristly hairs. Rostrum very long, brownish, dark at apex, extending on second venter. Body beneath brown to black. Head dark brown, with five stout, rather short, blunt, yellowish brown spines.

Pronotum dark brown, convex, pitted, reticulate behind, with three foliaceous carinae; lateral carinae blackish, long, strongly curved inward, with one row of large rectangular areolae; median carina distinctly angulate a little behind the hood; paranota broad, strongly reflexed, incurved behind, widest opposite humeri, there five areolae deep, the areolae moderately large; hood large, angulate above, dark brown. Elytra broad, widest near middle; costal area broad, mostly biseriate, a few extra cells in widest part, the areolae large, hyaline, iridescent and arranged in fairly regular rows; subcostal area rather wide, biseriate; discoidal area very broad, extending a little beyond middle of elytra, six areolae deep at middle, its apex slightly raised, broad, lighter in color, sutural area widely reticulate behind. Legs dark brown, slender, rather short. Carinae, elytra and paranota yellowish brown at base, covered with white exudation.

Length, 4.10 mm.; width, 2.00 mm.

Holotype, male, and two paratypes, São Paulo, Brazil, May 20, 1937, collected by E. J. Hambleton; allotype, female, Belo Horizonte, Brazil.

In this species and *P. diaphana* Champ. the pronotum and reticulations of paranota, carinae, and elytra are densely clothed with extremely fine hairs.

7. **Tigava bombacis**, sp. nov.

Pronotum moderately convex, closely pitted, tricarinate, the median carina slightly more raised and thicker, the lateral carinae discernible throughout their entire length but not prominent; paranota testaceous, narrow, with tiny, distinct areolae in front. Costal area narrow, the areolae small, nearly circular along basal portion. Subcostal area broader, mostly biseriate. Discoidal area not reaching middle, straight along outer margin, oblique within. Rostrum short, extending a little beyond prosternum.

Length, 5.35 mm.; width, 1.10 mm.

Holotype, male, allotype, female, and seven paratypes, Vicosa, Brazil, and one paratype, Rio Janeiro, Brazil, on "imbirussu" (Bombacae).

This species was wrongly determined by Drake and Hambleton (Arch. Inst. Biol., São Paulo, VI, 1935, p. 143) as *Tigava convexicollis* Champion, from which it may be separated by its much larger size, much less convex pronotum, longer third antennal segment (about three times as long as first), smaller and more nearly circular cells of costal area. *T. convexicollis* has the third antennal segment slightly more than twice as long as the first, and larger rectangular cells with thinner veins in the costal area.

8. **Tigava seibae**, sp. nov.

Elongate, the lateral margins of elytra and paranota finely serrate. Head black, shiny, with a median longitudinal groove and a short, brownish median anterior spine; posterior spines long, slender, testaceous, appressed to head along inner margin of eyes. Antennae very long, slender, segment I very long, rather stout, dark fuscous; II very short, blackish; III testaceous, two and one-half times as long as IV; IV mostly black, shorter than I. Legs long, slender, yellowish-brown, the tarsi and tips of tibiae black. Rostrum extending a little beyond prosternum, testaceous, fuscous at tip; rostral laminae moderately raised, testaceous, bucculae brownish, testaceous along margins, closed in front.

Pronotum strongly convex, coarsely pitted, reddish brown to dark fuscous, sharply tricarinate. Lateral carinae slightly divaricating anteriorly, non-reticulate but very distinct, slightly less elevated than median. Paranota very narrow, testaceous, with one row of tiny areolae. Collar testaceous, slightly raised with median carina so as to form a very small hood-like structure. Elytra brown to dark fuscous, the costal area testaceous. Costal area broad, the areolae large and mostly rectangular; subcostal area narrower, biseriate; discoidal area not reaching middle, five or six areolae deep in widest part, outer margin nearly straight, inner margin oblique.

Length, 4.15 mm.; width, 1.10 mm.

Holotype, female, allotype, male, and nine paratypes, Bahia, Brazil, collected on *Seiba pentandra* by Dr. Gregorio Bondar.

This species may be separated from *convexicollis* Champion and other members of the genus having uniseriate costal area by the much wider costal area with correspondingly larger areolae.

9. **Tigava graminis**, sp. nov.

Small, elongate, slender, testaceous, the head and pronotum except triangular process black. Head with five pale, slender, testaceous spines, the hind pair very much longer, looped forward so as to form a semicircle with the tips touching or nearly touching head. Rostrum long, extending onto metasternum; rostral channel deep, the laminae foliaceous, testaceous. Bucculae broad, contiguous in front, testaceous. Antennae slender, very long, testaceous, the apical segment mostly black; segment I extremely long, II short, III very long, slender, more than three times as long as IV, IV slightly shorter than I. Legs very long, slender, tarsi dark.

Pronotum moderately convex, shiny, closely and deeply pitted, tricarinate; median carina higher than lateral, slightly more elevated anteriorly, testaceous, composed of one row of small areolae; lateral carinae testaceous, indistinctly reticulate, slightly divaricating anteriorly; collar distinct, reticulate, testaceous, slightly elevated with median carina so as to form a small hood. Paranota narrow, mostly uniseriate, broader and biseriate opposite humeri, areolae small. Elytra with lateral margins finely serrate; costal area rather broad, uniseriate, the areolae large, hyaline and rectangular in form; subcostal area narrow, biseriate; discoidal area short, widest near middle, there four areolae deep.

Length, 3.50 mm.; width, .90 mm.

Holotype, female, allotype, male, and five paratypes, Bahia, Brazil, collected on Graminae by Dr. Gregorio Bondar.

The shape of the paranota and broad costal area readily separate this species from all closely allied members of the genus. It is perhaps most closely allied to *T. semota* Drake, but is much smaller, much more finely reticulate and with paranota distinctly broader.

BOOK NOTES.

Recent Advances in Entomology, by A. D. Imms. 2d edition. Pp. i–x + 1–431, figs. 1–94. (P. Blakiston's Sons & Co, Inc., Philadelphia. 1937. $5.00.)

In the seven years since the first edition of this work in 1930 many different ideas have surged upward in entomology. Perhaps the most notable single event has been the publication of Snodgrass's Morphology in 1935. This, as one of the many treatises and monographs on every aspect of entomology, has brought about many readjustments in perspectives. There have been new orientations in genitalia, in head segmentation, in homologies of appendages in the light of musculature. Hormones and their effect on metamorphosis are in evidence. Paleontology has likewise changed. All these changes have caused the rewriting of many chapters in the book, although some of them are virtually as in the first edition —in such, only slight changes have been made. There are, however, no additional chapters, although the inclusion of much new matter has added 56 pages to the book. There are also 27 new illustrations, but 18 of the original ones are omitted. The fifteen chapters, as in the first edition, bear on some aspects of morphology, metamorphosis, paleontology, sense organs and reflex behavior, the fundamental aspect of coloration, some aspects of ecology and its practical application, parasitism, and biological control. There are both an index of authors and a general index.

We note with regret that certain lapses pointed out in our review of the first edition still persist in this. Nevertheless, this is a most excellent work and while Dr. Imms categorically states that it is not intended for the specialist, specialists will find it extremely useful as tying together things outside of their own specialty.

There are a *very* few typographical errors; and after experiencing those that got by our own efforts in a book, our feelings are of regret. The book is excellently printed on good paper, the 94 illustrations are likewise good.

It is sincerely recommended as an addition to a general entomological library, for reading as well as for reference.

J. R. T.-B.

Genetics and the Origin of Species, by Theodosius Dobzhansky. Pp. i–xvi + 1–364, figs. 1–22. (Columbia University Press, New York. 1937. $3.60.)

This is one of those books which integrates into a logical whole innumerable facts working toward the understanding of the problem of species. It brings together in due relationship the many observational findings of geneticists, in a form usable by the general or special biologists. I do not in any way feel competent to offer any opinion as to the problem, facts or theories involved. On the other hand, I wish to draw special attention to the most important rôle of insects as the raw material for these studies on the physiological side of species formation. The ten chapters of the work deal with organic diversity, gene mutation, mutation as a basis for racial and specific differences, chromosomal changes, variations in natural populations, selection, polyploidy, isolating mechanisms, hybrid sterility and species as structural units. There is also an extensive bibliography.

In all the discussions, the dominant importance of insects among animals stands out. *Drosophila* in its several species is, of course, the classic insect of geneticists. But many others are to be found as subjects of experimentation. Among the Lepidoptera we find *Chaerocampa elpenor, Deilephila, Ephestia kuehniella, Lasiocampa quercus;* among Coleoptera, *Carabus, Coccinella, Epilachna* and sundry Chrysomelidae; among Hemiptera, *Cicada, Coccus pseudomagnoliarum, Eurygaster integriceps,* Membracidae, Fulgoridae; of course, the Cynipidae in Hymenoptera; and sundry other species and groups in other Orders. These are but a few of the many insects which have found observational and experimental use in genetics.

The last chapter of this work, on Species as Natural Units is commended to descriptive entomologists, in order to clarify their ideas. A species is either a subjective idea or an objective actual entity. Of course, as men, it becomes exceedingly difficult for us to separate with any finality the outer world of the senses from the inner world of the mind. As entomologists, we recognize and describe species, but as scientists our attitude (purely subjective, of course) should be that of stark agnosticism. J. R. T.-B.

PROCEEDINGS OF THE SOCIETY.

Meeting of April 15, 1937.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, April 15, 1937, at 8.30 p. m.

President William T. Davis in the chair, and nine other members present, namely, Messrs. Buchholz, Cooper, Dietrich, Dietz, Ragot, Sheridan, Shoemaker, Siepmann and Stecher; also Messrs. Burton August, Henry Bird, L. L. Pechuman and Miss Dietz.

The minutes of the previous meeting were read and approved. Mr. Davis read a communication from Mr. Engelhardt.

Mr. Dietrich proposed for membership Mr. L. L. Pechuman, Department of Entomology, Cornell University, Ithaca, N. Y. Mr. Pechuman being present, it was moved that the By-laws be suspended, and that the society proceed at once with the election of Mr. Pechuman; this motion was seconded and carried, and Mr. Pechuman was duly elected a member.

Mr. Ragot reported that he was handling the sale of the Moetz Collection of Lepidoptera.

Mr. Henry Bird presented the paper of the evening on the subject of "Man, the Great Despoiler." He spoke of what the Eastern United States, including even Manhattan Island, must have been like before the advent of man; then how the trees had been cut down and the fields burnt over. With the burning-over of the fields, the native grasses and plants are replaced by the unattractive blue bent or Virginia beard grass, *Andropogon virginicus*. During the past years, most of the fields in Westchester County and other suburban areas have been largely given over to this grass.

Mr. Bird mentioned also Royal Palm Park in Florida. This park, which has been taken over by the government, still preserves its original vegetation, and one can see what Florida was like before it was despoiled by man. The park is entirely surrounded by water, so it is protected from forest fires that might start near-by.

Mr. Bird spoke also of the disappearance of insects with this despoliation. Many insects once common in the vicinity of New York are now almost extinct. To the general public, insects are something to be despised and destroyed, and no one ever seems to care whether they disappear or not. One never hears of a move to preserve insects, yet many insects are beneficial, and most of them help to keep the balance of nature. Of the 15,000 species of insects in New York State only about 150 species are bad actors. The remaining species are for the most part innocuous, but many beneficial insects are included.

Among the insects disappearing from this vicinity, Mr. Bird mentioned the fly *Masicera senilis,* the hop borer, and the borer in sunflower.

Mr. Davis mentioned that lichens have pretty much disappeared from Staten Island, and with it the grouse locust, which feeds on lichens, has gone. The true Katydid is probably extinct on Staten Island, although there are still considerable woods left.

Mr. Cooper mentioned *Calosoma externum* as a beetle which was rapidly disappearing.

The meeting adjourned at 9.45 p. m.

Carl Geo. Siepmann,
Secretary.

Meeting of May 13, 1937.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, May 13, 1937, at 8.30 p. m. President William T. Davis presided, and 12 other members were present, namely, Messrs. Bodenstein, Buchholz, Cooper, Dietrich, Dietz, Engelhardt, McElvare, Pechuman, Ragot, Shoemaker, Siepmann, and Stecher; also, Messrs. Richard Fisco, H. R. Hagan, John C. Lenz, and Miss Dietz and Mrs. Hagan.

The minutes of the previous meeting were read and approved. Mr. Engelhardt reported as Treasurer, and read a note from Mr. Torre-Bueno, reporting that all the manuscript for The Glossary was with the printer, and that the new edition was expected to be out on or before the first of September. Mr. Engelhardt also reported that he had seen Mr. Torre-Bueno personally during his recent trip to the Southwest.

The secretary read a letter from the New York Academy of Sciences, which was placed on file. A committee was appointed to report further on the matter.

Mr. Fisco exhibited a specimen of the early red-margined form of the Luna moth—the variety *rubromarginata.* He also showed some tiger beetles, *Cicindela purpurea* and *tranquebarica* taken at Lakehurst, N. J., in late March.

Mr. Ragot exhibited specimens of brilliant exotic Lepidoptera from the Moetz Collection.

The speaker for the evening was Mr. Kenneth W. Cooper, of the Laboratory of Cytology, Columbia University, who spoke on "Complexities of Reproduction and Biology of the Grass Mite, Pediculopsis," illustrating his talk with lantern slides and specimens.

The eggs of this mite hatch, and the offspring grow to maturity, within the mother's body. Mass birth results from the bursting of the mother's hysterosoma, and release of the mature offspring. Copulation takes place within the mother, prior to birth. The males constitute about 4.5 per cent of the normal brood, and there is at least one male in every brood. If a single individual constitutes the entire brood, then that one individual is a male.

Virgin females, obtained by dissecting immature specimens from the hysterosoma of the female sometimes produce parthenogenetic offspring, and these are always males.

Females have six chromosomes; the males are haploid, *i.e.,* have half that number.

Mr. Cooper's paper appeared in the Proceedings of the National Academy of Sciences, vol. 23, no. 2, pp. 41–44, February, 1937, and he intends to publish the results of a further study elsewhere.

The meeting adjourned at 10.00 p. m.

CARL GEO. SIEPMANN,
Secretary.

MEETING OF OCTOBER 14, 1937.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, October 14, 1937, at 8.15 p. m. President William T. Davis in the chair, and ten other members present, *viz.,* Dr. Dietrich, Messrs. Buchholz, Cooper, Dietz, Engelhardt, McElvare, Ragot, Sheridan, Shoemaker, and Siepmann; also James T. Farrelly, Jr., Richard Fisco, and Miss Dietz.

The minutes of the preceding meeting were read and approved. Mr. Engelhardt presented the report of the treasurer, which was placed on file. Income for the year to date was $1912.46; disbursements, $1557.63, leaving a balance in the drawing account of $354.83. Mr. Engelhardt also showed copies of the new and revised edition of the GLOSSARY, which came out last month. He said that the book was really a very fine job, with clear, well defined illustrations, and that entomologists have commended the society very highly on this new edition. He also read the "Report on Glossary to the Brooklyn Entomological Society," which was placed on file.

A motion was made by Mr. Sheridan that the business and financial end of the new GLOSSARY continue to be in the hands of Mr. Engelhardt. The motion was unanimously carried.

The following resolutions were unanimously adopted:

"After five years of preparation, the new and revised edition of the Glossary has finally appeared on September 20, 1937. The task in preparing this work, which was a tremendous one, was performed by Mr. Torre-Bueno.

"Whereas, the Glossary will be a valuable contribution to American entomology, and will enhance the prestige and good name of the Society, and will be a source of income to it for many years,

"Be it resolved, therefore, that the Brooklyn Entomological Society express a vote of thanks and appreciation to Mr. Jose R. de la Torre-Bueno for his excellent work in compiling and editing the new edition of the Glossary, and to Mr. George P. Engelhardt for his assistance in an executive capacity, which have made this book possible.

"Be it further resolved, that these resolutions be spread upon the minutes of the Society, and that the Secretary be instructed to forward a copy of these Resolutions to Mr. Torre-Bueno."

Mr. Shoemaker reported that he had been on a collecting trip to Mt. Mitchell and Mt. Gibbs, in North Carolina, in company with Mr. Stecher. Each of them obtained about 1500 beetles in twelve days collecting. Mr. Shoemaker said he had about 75 species of beetles altogether, of which about 15 were new to his collection. Mr. Beutenmüller, who collected in these mountains many years ago, took over a thousand species here, over a period of six years. But in those days conditions were different. The mountains were covered with a dense growth of evergreens, but fire has since burned off pretty near all of them. About a hundred bait bottles were planted. Two speciments of *Scaphinotus irregularis,* which was described by Beutenmüller from that locality, were obtained. Sifting did not amount to much. The insect they especially wanted to get was a very bright green longicorn, *Anthophilax hoffmanni,* also described by Beutenmüller. A fine series of this beetle was obtained, and with the exception of two or three specimens, all of them were found on the trunks of three-quarter dead trees. Mr. Shoemaker expressed doubt that collectors would be able to get any more of them, as the C.C.C. are cutting down all the dead trees and carting out the logs, so that there won't be any place for these insects to breed.

The trees on the mountains include balsam, hemlock and spruce. When Mr. Shoemaker got there, the rhododendrons were in full bloom, and he extolled highly the beauty of this region.

Mr. Cooper exhibited specimens of Strepsiptera and stylopized wasps, and commented upon their habits. Strepsiptera are parasitic upon wasps, and a few species upon other insects, and are usually very local in distribution. The males emerge very early in the morning, are active for a short time, and then die. The females never leave the body of their host. As it is the head end of the insect that protrudes from between the segments of its host, some question has arisen as to how fertilization takes place. It has been shown that the females are fertilized from the head end, and that the seminal fluid reaches its objective by passing along the outside of the female through a canal formed by the last larval skin.

Mr. Cooper mentioned that no species of Strepsiptera are recorded from Long Island in the New York State List, probably because of the difficulty of determining specimens. He exhibited specimens of *Xenos sp.* from Flushing, L. I., N. Y., September 16, 1937, taken by himself, and specimens of *Xenos wheeleri,* taken by Dr. Hughes-Schrader, of the Department of Zoology, Columbia University, on Staten Island, New York, and at Cold Spring Harbor, L. I., N. Y., 1924. Hughes-Schrader has also collected this species at Suffern, N. Y., and has published an extended report of her collecting and rearing experiences of *Xenos* in the Journal of Morphology and Physiology, volume 39 (1), pp. 157–205, 1924.

Mr. Buchholz exhibited specimens of Lepidoptera obtained during the past summer. Among them were:

Chlorippe (*Apatura*) *celtis.* One specimen obtained, the third specimen of this species to be reported from New Jersey.

Calephelis borealis. Taken in numbers in Sussex County, N. J. The species was originally taken in New Jersey by Smith. Comstock and Dos Passos since tried to find the locality where it was obtained. The species was only recently rediscovered in New Jersey.

Euphyes dion var. *alabama.* About sixty specimens taken in Ocean County, N. J.

Lycomorpha pholus. About thirty specimens taken in Sussex County, N. J. The larva feeds on lichens.

Eubaphe brevipennis: Four females were taken at Great Notch, New Jersey, in the Orange Mountains, on June 13th, from whose eggs 230 specimens were obtained at the end of six weeks. Although a brood completed in six weeks under artificial conditions, that probably wouldn't be the case in nature. The series of specimens showed much variation, especially in the lower black band. The specimens run pretty constant, though, and you can almost tell from which female's eggs a given specimen hatched. If you get a female with a break in the black band, all the females from the same brood have the same break in the band.

Dr. Dietz reported that he had not taken a single specimen of *Feralia jocosa* during the past summer. He did, however, take a female of *Papilio turnus* var. *glaucus* at the end of July.

Mr. Ragot reported collecting in the Mt. Alto (Pennsylvania) Forest Preserve, a 25,000 acre tract located 20 miles west of Gettysburg.

The meeting adjourned at 10.10 p. m.

CARL GEO. SIEPMAN,
Secretary.

MEETING OF NOVEMBER 11, 1937.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, November 11, 1937. The meeting was called to order at 8.30 p.m. by President William T. Davis. Eight other members were present: Dr. Dietrich, Messrs. Buchholz, Dietz, Engelhardt, Nicolay, Ragot, Siepmann and Stecher; also, Messrs. Richard Fisco, and John D. Elfstrom, Miss Dietz, Mrs. Dietrich and Mrs. Siepmann.

The minutes of the previous meeting were read and approved. Mr. Engelhardt reported that sales of the GLOSSARY were progressing favorably, that the book was receiving adequate publicity, and that comments and criticisms were very favorable.

Mr. Siepmann said that Mr. Charles A. Ballou had a new Long Island record to report in the Histeridae—*Hister carinifrons.* The type of this species, described by Schaeffer, was taken at St. Petersburg, Florida, in November, and is now in Mr. Ballou's collection. Up to now, this was the only known specimen. Mr. Ballou also saw a specimen in Mr. Davis's collection taken at Montauk, Long Island, in September, and also a specimen from Woods Hole, Massachusetts, taken in August. This September, Mr. Ballou heard that Mr. Angell contemplated making a trip to Montauk, Long Island, and since this was a likely time and place to look for *carinifrons,* Mr. Ballou asked him whether he would pick up all the Histeridae he could find. Mr. Angell saw a number of Histerirae crawling on the sands at Montauk, and filled a vial with them, which he turned over to Mr. Ballou. All but one specimen were *Hister carinifrons*—101 specimens in all. The dates were September 3rd to 8th.

Mr. John D. Elfstrom exhibited a specimen of *Scaphinotus viduus* which he collected near Richmond, Staten Island, this summer. It is the first specimen taken on Staten Island for a number of years.

Mr. Davis exhibited specimens of the Cicadas *Tibicen resonans,* Walker 1850; *Tibicen figurata,* Walker 1858, and *Tibicen similans* Smith and Grossbeck, 1907, collected near the coast in North Carolina, South Carolina and Georgia in September, 1937, by Mr. George

P. Engelhardt and Mr. Rowland R. McElvare. It was pointed out that in form and color these three species resembled one another rather closely, as often happens among associated species. In Distant's Catalogue of 1906, *resonans* and *figurata* were considered belonging to the same species, but they are quite distinct.

Mr. Otto Buchholz lately received the Cicadas, *Cacama dissimilis* Distant and *Cacama valvata* Uhler, which were also shown. Both species were collected June 13, 1937, in the Catalina Mountains, Arizona. These two species occur together and also resemble each other quite closely, but in the first-mentioned the rostrum is longer, reaching the posterior coxae; the opercula are long; and the first and second crossveins in the forewings are darker than in *valvata.*

Mr. Engelhardt spoke on his collecting trip last July in the Rocky Mountains, supplementing his talk with specimens and photographs. The trip was made by automobile, in company with Dr. Klots, and at Colorado Springs they were joined by Mr. Chadwick and Dr. Davenport of Harvard University.

On the way out, driving through Kansas, great swarms of grasshoppers, representing several species, were encountered. The crop injury caused by these grasshoppers was evident. In some places the corn stalks were chewed off to the ground.

A stop was made at Florissant, Colorado, noted for fossil insects, plants and so on. The fossil beds, which consist of limestone, have been dug up here and there, but on the whole they have hardly been touched. Mr. Engelhardt made a little try at fossil collecting, but did not try long enough to get anything worth while. Almost every piece of limestone has some kind of fossil in it, but the chunks pulverize if they are too dry, and break into little pieces, if too wet.

Mr. Engelhardt described Monarch Pass as an excellent collecting place for high elevation species. The pass itself is 11,366 feet above sea level, and mountains on either side rise up to 13,000 or 14,000 feet. Lycaenids were common and the larvae of one species, apparently single-brooded, was noted under stones on July 8th, to winter as pupae until the season of 1938.

Camp was made at Trout Lake, 10,000 feet, in the San Juan Mountains, near Telluride, Colorado, at the foot of Yellow Mountain. Much of this mountain consists of rock slides. The butterfly *Erebia magdalena* occurs here, and it seems to be found only on the roughest sort of rock slides. It is really not a rare butterfly, but collecting it is so precarious, that not many are taken. Mr. Chadwick is specializing in *Argynnis,* attempting breeding experiments. Mr. Engelhardt, as usual, was on the lookout for clearwing moths. He obtained *Synanthedon gilea* larvae boring in the roots of wild geranium. He has them home now, wintering as larvae. He had difficulty in getting a clue to the foodplant, but ultimately saw a female ovipositing. This species has never been bred. Another clearwing, *Albuma pyramidalis* was collected at altitudes up to 12,000 feet. It is a root borer in *Epilobium autumnalis.*

At St. Johns, Arizona, a Mormon town near the New Mexican border, *Dictyosoma elsa* and *Sphinx separatus* were collected at lights. A discussion followed, in which Mr. Buchholz participated, regarding the foodplant of *Dictyosoma elsa,* which is said to be a bush with small, thick leaves and light gray stems. The few insects that now appear at electric lights, compared with the multitudes that came when electric street lights first came into use, was also discussed. The diminution is probably due to the killing off of those species that frequent the lights.

Mr. Engelhardt's remarks include incidents on visits to the Mesa Verde, La Plata Mountains and the Durango regions in Colorado, to Ship Rock and Navajo Reservations in New Mexico, and the petrified forest, White Mountains, and the Boyce Thompson Desert Arboretum in Arizona.

The meeting adjourned at 10.40 p. m.

Carl Geo. Siepman,
Secretary.

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Vol. XXXIII April, 1938 No. 2

A REVIEW OF THE GENUS CHRYSOLINA MOTSCHULSKY IN NORTH AMERICA (COLEOPTERA-CHRYSOMELIDAE).

By Edwin C. Van Dyke, University of California,
Berkeley, California.

The generic name *Chrysolina* Mots. is here used in place of *Chrysomela,* for according to Maulik[1] the latter name is no longer valid for the group of insects that it has been used to include, seeing that Latreille designated *C. populi* L. as the genotype of *Chrysomela.* As a result *Melasoma* Stephens becomes a synonym of *Chrysomela,* and *Chrysolina* Mots., the first available name, has to be resurrected for the more typical members of the old Linnaean genus.

In this country there are but a few species as compared with the large number in the Old World. They have been specially studied a number of times, notably by Rogers,[2] Crotch,[3] and Linell,[4] but the descriptions and discussions concerning them are so brief in many cases that they are unsatisfactory. Much new material and new information has also been secured in recent years. This it seems justifies a restudy and review of the species.

For this work I have had access to the large collection of the California Academy of Sciences which includes the extensive collections of Blaisdell, Fenyes, and myself besides numerous smaller ones; the rich C. W. Leng collection of Chrysomelidae now in the hands of A. R. Mead; besides material furnished on loan or as a gift by

---

[1] Anns. and Mag. Nat. Hist., (19), XV, Jan. 1925, pp. 95–96.

[2] Synopsis of Chrysomelidae of the U. S., by W. F. Rogers, Proc. Ac. Nat. Sci. Phil., 1856, pp. 29–39, pl.

[3] Material for the Study of the Phytophaga of the United States, by G. R. Crotch, Proc. Ac. Nat. Sci. Phil., XXV, 1873, pp. 50–51.

[4] A Short Review of the Chrysomelas of North America, by Martin Linell, Journ. N. Y. Ent. Soc., IV, Dec. 1896, p. 200.

JUN 13 1938

Owen Bryant, Kenneth Maehler, and Hugh Leech. Dr. H. C. Fall has also very kindly examined for me, the Rogers types which are now in the Museum of Comparative Zoology at Cambridge, Mass. To the owners and custodians of these collections as well as to Dr. Fall, I, therefore, wish to acknowledge my indebtedness, for without their aid this study could not have been made.

Key to Species.

1. Lateral groove of pronotum well defined and complete from base to apex 6
   Lateral groove of pronotum poorly defined, generally more or less obliterated anteriorly 2
2. Elytral striae generally well impressed and strial punctures more or less regularly arranged 3
   Elytral striae not impressed except occasionally in females of *hudsonica* and strial punctures often somewhat irregular posteriorly 4
3. Wingless, very convex, black with dorsal surface a unicolorous metallic green or blue-green color, elytral striae generally deeply impressed or sulcate with the strial punctures regularly arranged though often vague and the intervals convex or carinate and finely rugose . . . . *subsulcata*
   Fully winged, moderately convex, black, upper surface aeneous or with elytra a deep violet, legs and sides of prothorax to a great extent a reddish orange, the elytral striae feebly impressed and more or less regularly and distinctly punctured, the inner intervals somewhat convex and generally impunctate, the outer broader, flatter and as a rule irregularly punctured . . . . **blaisdelli**
4. Elytra black or aeneous with margin or at least epipleura flavous 5
   Entire insect above bluish black or aeneous, the elytra sometimes violaceus, rarely with epipleura faintly flavous. **vidua**
5. Flavous elytral margins rather broad, almost reaching eighth striae, the rest of upper surface black or with a very faint bluish or bronze tinge . . . . *flavomarginata*
   Flavous marginal area confined to epipleura or at most extending but slightly beyond marginal bead, the rest of upper surface distinctly metallic, aeneous or greenish; species generally much smaller and narrower . . . . *hudsonica*
6. Elytra with strial punctures generally rather regularly arranged; the insect as a whole elongate oval or elliptical and

with smooth and shining surface; color a deep blue or violet with the elytra variable, cupreous (typical phase), bright green, bronze black, or deep blue or violet. *auripennis*

Elytra with strial punctures much confused and not readily separated from the numerous scattered interstitial punctures; the insect less elongate, often globose and inclined to be dull in appearance 7

7. Rather small, oval, apterous, sides of prothorax conspicuously arcuate, unicolorous blue or green .... *basilaris*

Somewhat large, globosely oval, winged, sides of prothorax moderately arcuate and more convergent forwards, aeneous black, subopaque .... *subopaca*

Chrysolina subsulcata (Mannerheim).

Chrysomela subsulcata (Motschulsky) Mannerheim, Dritter Nachtrag der Aleutischen Ins., Bull. Mosc., XXVI, 1853, p. 254.

Of moderate size, very convex, body an aeneous black, upper surface varying from dull green to a bluish green, antennae with underside of two or three basal segments flavous. Head smooth and shining, finely, sparsely punctured, front flattened or feebly convex; antennae robust, gradually broader outwards from fourth segment, the intermediate segments about as broad as long, and reaching about one segment behind margin of prothorax. Prothorax broad, hind margin broadly arcuate at middle, front margin transverse or feebly arcuate medially as seen from above, and finely margined, lateral grooves deep and complete, the sides thickened and convex and projecting well forward in front, the disk smooth and shining, finely, sparsely punctured, more coarsely basally and near lateral grooves. Elytra about 1 mm. longer than broad, very convex, varying from deeply sulcate with carinate intervals to a condition where the surface is somewhat even, with the striae but little impressed or very fine. Under-surface generally finely, sparsely punctured. Length 7–8 mm., breadth 5.25–6.25 mm.

Type collected on St. Paul Island, Pribilof Group, Behring Sea, by Wosnesensky, and now most likely in the Leningrad Museum.

This species is a very variable one as are most boreal, wingless species. In the series of ninety-one specimens belonging to the California Academy of Sciences, collected on St. Paul and St. George of the Pribilof Group of islands, the type locality, are specimens having the elytra deeply sulcate with the intervals sharply carinate as well as others which show all stages of intergradation to those which have an even surface with fine striae but feebly impressed. The more typical sulcate or subsulcate specimens are generally dull in appearance as the result of the intervals being finely rugose while those of the opposite extreme are smooth and shining. The color varies from bottle green, to bright green, blue green, green with coppery reflections or rarely to a deep blue.

Until a few years ago, the only specimens known were from the type locality. On July 13, 1899, Prof. Trevor Kincaid while on the Harriman Expedition obtained one specimen on Popof Island of the Shumagin Group, south of the Alaska Peninsula. In 1914, F. Johnson, for the Canadian Arctic Expedition, also collected a number of specimens near Kanganevik and other places about Camden Bay and on the tundra east of Collinson Point, British North West Territory, while on July 31, 1916, J. August Kusche collected a single specimen, now in my possession, at St. Michael, Alaska. Owen Bryant did not find the species in the Mackenzie Delta region. The species lives on the dwarf or creeping willow. Prof. Kincaid described and figured the various earlier stages in the Harriman reports. This species is not closely related to any other North American species but it is very close to a number which are to be found along the north coast of Siberia, as far east as East Cape, all of which are to be placed in the Group Pleurostica of Motschulsky.

Chrysolina blaisdelli Van Dyke, new species

Rather small, moderately convex, oval, body black, upper surface a greenish bronze in type and bronze with deep blue elytra in paratypes, and with sides of elytra in great part, antennal segments 1–4, legs except knees, and sides of last ventral segment a reddish orange. Head rather coarsely, not closely punctured, the median and fronto-clypeal sutures sharply defined and a well marked triangular impression in front; antennae about reaching hind margin of prothorax, with segments 1–6 somewhat longer than broad, 7–11 transverse and gradually broader. Prothorax more than twice as wide as long, median portion of base slightly arcuate, apex feebly emarginate, lateral grooves shallow but complete and sparsely, coarsely punctured; disk sparsely, finely punctured, more evidently so towards base and apex, in one specimen rather coarsely and more generally punctured, the sides but little thickened and with a median black spot somewhat interrupting the orange marginal border. Elytra .5 mm. longer than broad, moderately convex, minutely alutaceous, the four inner discal striae finely but definitely impressed and with the distinct strial punctures somewhat regularly arranged, the lateral striae vague and the punctures more or less indistinguishable from the scattered interstrial punctures, the even intervals 2, 4 and 6 much narrower than the odd in the type and the odd intervals 3, 5 and 7 impunctate and a bit convex, in the paratypes the intervals 4, 6 and 8 are fully as broad as the odd intervals or even broader and irregularly punctured. Beneath minutely, sparsely punctured except propleura and apex of last ventral segment which are more coarsely punctured. Holotype, length 5.5 mm., breadth 3.5 mm., allotype and paratypes, length 6.5 mm., breadth 4.25 mm.

The apex of the last ventral segment in the male is broadly truncate and in the female arcuate as usual. In the smaller holotype, the apices of the elytra are normal but in the other specimens they are a bit produced.

Holotype male and allotype female (Nos. 4561 and 4562, Mus. C. A. S. Ent.), collected at Nome, Alaska, in July 1910, by Dr. F. E. Blaisdell. Paratype males, one somewhat injured, collected at Aklavik, North West Terr., Canada, one on June 16, 1931 (Lot 233), the other June 20, 1931 (Lot 237) by Owen Bryant. One of the latter was found walking on the tundra at an altitude of 2000 ft.

This rather small species might be confused with *hudsonica* but the orange colored legs and lateral margin of prothorax as well as the peculiar type of sculpturing should enable it to be definitely separated.

Chrysolina vidua Rogers

Chrysomela vidua Rogers, Syn. of Chrysomelidae, Proc. Ac. N. S. Phil., 1856, p. 36.

Chrysomela subseriata Lec., Notes on Col. fr. Fort Simpson, Proc. Ac. N. S. Phil., 1860, p. 321.

Of moderate size, elongate oval, moderately convex, black, upper surface aeneous, blue black or more commonly dark blue, the elytra often slightly contrasting in color to the head and pronotum. Head with front sparsely, finely punctured, clypeus more coarsely so, fronto-clypeal suture sharply defined, the frontal suture obscurely indicated but front feebly impressed at middle along sutural line; antennae rather long, reaching four segments beyond base of prothorax, segments

> 7–8 about as long as broad, the remainder distinctly longer than broad. Prothorax more than a third wider than long, base broadly arcuate at middle, apex feebly emarginate as seen from above, lateral grooves shallow behind, obscure in front but more or less outlined by the coarse punctuation throughout its course, disk rather finely, not densely punctured. Elytra about 1 mm. longer than broad, moderately convex, minutely alutaceous yet shining, striae not impressed but series of strial punctures of moderate size, separated by from one to three times their own breadth, and rather regularly arranged basally, obscure apically, intervals flat with from 1–3 irregular series of fine punctures and generally feebly rugose. Beneath finely and sparsely punctured. Length 6–8 mm. (average 7 mm.), breadth 4.5 mm. (average 4.25 mm.).

As noted by Schaeffer[5], this species was supposed to be the same as *basilaris* (Say), by Crotch, 1873, Linell, 1896, and most subsequent workers. It is generally labeled *basilaris* (Say) in most collections. The true *basilaris* as noted by Schaeffer is something entirely different as will be seen later. *Chrysolina vidua* (Rogers) in physical characters rather closely resembles *flavomarginata* (Say) and according to Schaeffer and others is but a subspecies of that. I cannot agree with this opinion. I consider the line of cleavage between the two too great to allow of their being so closely associated. Most specimens of *vidua* are inclined to be somewhat larger than *flavomarginata,* to be rather more convex, have the lateral prothoracic sulci better defined though always shallow and with a tendency to completeness which is not the case in the other, have the upper surface a more or less uniform bluish-black or blue color in contrast to the faint bronze color of the latter and lack the broad yellow margin to the elytra. The elytral intervals are also generally feebly rugose as well as very distinctly punctured and dull in contrast to the much smoother, more shining and very finely punctured surface in the other. In a few specimens the epipleura are faintly flavous. The deep blue or violet colored specimens can always be separated from the subspecies *cyanea* of *auripennis* by the latter always having the lateral grooves of the prothorax deep and complete as well as being generally larger. The blue phase of *basilaris,* the *montivagans* of LeConte, has the prothorax broadly rounded at the sides and much narrowed posteriorly and the elytra much narrowed basally as a result of being wingless as well as more irregularly punctured.

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[5] Short studies in the Chrysomelidae (Coleoptera), part 2, by Chs. Schaeffer, Journ. N. Y. Ent. Soc., vol. XLI, p. 479.

In general *vidua* ranges more to the northwest than does any of our other species. Rogers' type specimen came from "Oregon, Col. McCall," and the type of *subseriata* LeConte from "Oregon or Rocky Mountains," probably the former locality. I have seen a specimen from Montana, but none from east of the Rocky Mountains south of this state. Most specimens known to me have been collected in eastern Washington: Pullman, Wawari and so forth; northeastern Oregon: Baker; northern Idaho; and southeastern British Columbia: Vernon. This distribution would seem to substantiate Schaeffer in his opinion that this species is not the *basilaris* of Say for Say received nothing from west of the Rocky Mountains.

Chrysolina flavomarginata (Say)

Chrysomela flavomarginata Say, Descr. Col. Coll. in Exped. to Rocky Mts. under Maj. Long, Journ. Ac. N. S. Phil III (1824), p. 452.

Similar to preceding in size and general appearance but somewhat less convex, smoother and more shining, of a black color with faint aeneous or bluish gloss and with the epipleura and sides of the elytra flavous to about the eighth striae. Head minutely, sparsely punctured, clypeus more coarsely so, fronto-clypeal and median suture in front well defined, the frontal impression vague or lacking; antennae extending four segments beyond hind margin of prothorax, all segments apparently longer than broad though outer segments quite robust. Prothorax more than a third wider than long, base arcuate at middle, apex feebly emarginate, lateral grooves shallow, in most cases obliterated in front, but with series of coarse punctures scattered along them, the disk very finely and rather distantly punctured except denser near base in some cases. Elytra about 1 mm. longer than broad, minutely alutaceous, the striae not impressed but strial punctures more or less regularly arranged except towards apex where to a great extent obliterated, the intervals flat and rather finely, sparsely and irregularly punctured, the general surface smooth and shining though at times feebly and minutely rugose. Beneath finely, sparsely punctured. Length 6–7.5 mm., breadth 4–4.5 mm.

As indicated in the previous description, this species is closely related to it, differing chiefly by having a flavous marginal band to the elytra and by being generally of a blacker color with but a faint bronze or bluish lustre. This species is even more closely related to the European *marginata* L.

According to Say, his type specimen was collected by Thomas

Nuttall in Missouri. This means of course the old Missouri Territory and judging from reports of Nuttall's travels, the locality would be somewhere in the region of the Dakotas. Specimens that I have seen have been collected in Colorado: Denver, Fort Collins, Glenwood Springs, San Louis, and so forth; western Kansas and Nebraska: Sioux Co.; South Dakota: Volga (Truman); Alberta: Calgary (O. Bryant); Utah: Vineyard (T. Spaulding); Montana; and Ohio (Leng Coll.). The Louisiana locality given in the Leng Catalogue, I question for the species is in the main confined to the Rocky Mountain region. Recently a series of eighteen specimens was collected near Flagstaff, Arizona, by Kenneth Maehler and another series from Big Bear Lake, San Bernardino Co., Calif., collected July 11, 1937, by Darwin L. Tiemann and submitted by Earl Herald, also a single specimen from near Seven Oaks in the San Bernardino Mts. of California by W. C. Reeves. These latter are interesting not alone in giving more western localities but in putting on record another example of that transverse distribution of Rocky Mountain species which has been noted with regard to a number of insects such as *Calosoma tristis* and to a certain degree the genus *Amblychila*. According to Wickham, the species feeds on *Artemisia dracunculus* L.

Chrysolina hudsonica Brown

Chrysolina hudsonica Brown, Canad. Entom. LXX, 1938, p. 35.

Rather small, elongate oval, smooth and shining, black with a decided aeneous lustre and the underside of the first two antennal segments and epipleura fulvous, the yellow portion of the latter sometimes extending up the sides of the elytra to the extent of an interval. Head alutaceous with a few minute punctures on front and some coarser ones on clypeus, the fronto-clypeal suture distinct but the median suture sometimes feebly defined in front and as often obliterated; antennae extending two segments beyond hind margin of prothorax, the segments all longer than broad and the outer more robust. Prothorax almost twice as broad as long, base broadly arcuate at middle and apex almost transverse as seen from above, lateral grooves shallow, in most cases obliterated in front, disk alutaceous like head and elytra, finely, sparsely punctured, denser behind and with coarser punctures along lateral grooves. Elytra almost 1 mm. longer than broad, the striae not impressed except in two somewhat larger females from Nome where they are distinctly so, the strial punctures distinct and

> somewhat regularly arranged, at least in front and in the more northern specimens such as those from Nome and Aklavik, and very fine and somewhat obliterated in the Churchill specimens, the intervals flat and sparsely, finely, irregularly punctured, except in the Nome females where they are feebly convex. Beneath very finely, sparsely punctured. Length 3.5–4.5 mm., breadth 3.5–4.5 mm., the smaller dimensions pertaining to the Churchill specimens, the larger to the Nome females.

I have examined the following specimens, two males and two females, collected at Nome, Alaska, July 1900, by Dr. F. E. Blaisdell, and a series of four specimens collected at Aklavik, Canadian North West Territory, June 20, 1930, by Owen Bryant. The Nome specimens are bronze and the Aklavik or Mackenzie Delta specimens somewhat greenish or bluish and in general a bit smaller. Besides these there is a series of eight specimens collected at Churchill, Manitoba, on Hudson Bay, June 10, 1930, by Owen Bryant which are still smaller and smoother. This last is the phase which has been described by Brown who had a very large series, also collected at Churchill.

This species is definitely related to *flavomarginata* (Say) but it seems to me is quite distinct. The more northern specimens of *flavomarginata* such as those from the Dakotas, Montana and Calgary, Alberta, are as true to type as are those from Colorado and very readily separated from all varieties of the arctic species which is in general smaller, more bronzed, with a narrower flavous margin to the elytra, with the basal segments of antennae somewhat flavous, lacking in *flavomarginata,* with a more evident alutaceous sculpturing to the upper surface, and in general a more elongate and narrower body, especially as regards the Aklavik and Churchill specimens. It might possibly be regarded as a subspecies of *flavomarginata.* The specimens in hand, however, show a most definite line of demarkation between the two, so until true intermediates are found, I believe that they should be kept as distinct species. Their food habits are also different, I believe. *Flavomarginata* feeds on a species of *Artemisia* whereas *hudsonica,* according to Blaisdell and Bryant, feeds on willow.

Chrysolina auripennis (Say)

> *Chrysomela auripennis* Say, Descr. Col. Coll. in Exp. to Rocky Mts. under Maj. Long, Journ. Ac. N. S. Phil. III (1824), p. 452.
>
> *Chrysomela cribraria* Rogers, Syn. of Chrysomelidae of U. S., Proc. Ac. N. S. Phil., 1856, p. 36.

Chrysomela inornata Rogers, loc. cit., 1856, p. 36.
Chrysomela auripennis cyanea Schffr., Journ. N. Y. Ent. Soc. XLI, 1933, pp. 479, 480.

Rather large, elongate oval, moderately convex, head, prothorax, scutellum and underside of body with appendages always a deep blue or violet, the elytra on the other hand varying from cupreous to bright green, to bronze black and to a deep blue or violet, unicolorous with rest of body. Head obscurely punctured except at sides and anteriorly, clypeus distinctly punctured, fronto-clypeal suture distinct at least at sides, the front impressed along frontal sutural line but suture indistinct; antennae extending at least two to three segments beyond hind margin of prothorax, all segments except second distinctly longer than broad, the outer somewhat broader. Prothorax almost twice as wide as long, base broadly arcuate at middle, apex transverse at middle or feebly arcuate as seen from above, lateral grooves deep and complete and with series of coarse punctures at bottom of groove, the outer margin quite convex, the disk minutely alutaceous and finely, sparsely punctured. Elytra slightly longer than broad, indistinctly yet minutely alutaceous, striae not impressed, punctuation variable, the strial punctures in most specimens rather coarse and somewhat regularly arranged, the interstrial punctures, however, varying from rather fine and scattered in the more eastern specimens to a condition where they are fully as coarse as are the strial punctures, giving the surface the appearance of being coarsely and irregularly punctured, a condition commonly found in the specimens from the more western parts of Texas and from New Mexico and Arizona. Beneath sparsely, coarsely punctured along metapleura, elsewhere finely and sparsely punctured. Length 8–10.5 mm., breadth 5–6 mm.

Say's description was based on a specimen found in "Arkansas . . . near the Rocky Mountains." The portion of the old Arkansas Territory near the Rocky Mountains is now about eastern Colorado. Most of the specimens with moderately cupreous elytra which would answer to the original description, are from Illinois, Indiana, Iowa, Kansas, Nebraska, eastern Colorado, and eastern Texas. Rogers' *cribraria* which was "bronze black" was from the "Southern States." I have two specimens before me from Fort Sam Houston, Tex., collected by Chapman Grant, which agree perfectly with the description. These cannot be separated from typical *auripennis* except as to color. Most Texas specimens that I have seen and I have had a large study series collected at Falfurrias by

J. O. Martin and E. G. Linsley, have the elytra a brilliant green though there are a few showing the cupreous gloss which indicates that they are but color phases. These Texas specimens of both colors also show the grosser interstrial punctures which is such a characteristic feature of the more western specimens. In a single specimen from Grant Co., N. Mex., collected by R. T. Kellogg, the elytra are blue-green, yet the insect is truly bicolored for the forebody is deep violet, contrasting strongly with the elytra. Another single specimen, from the White Mts. of Ariz., collected by F. H. Parker and now in the collection of Owen Bryant, has the elytra more brilliantly cupreous than any other specimen that I have seen. This specimen also has the elytra more coarsely and densely punctured than any of the other specimens. The entirely violaceous specimens mentioned by Rogers as from New Mexico are no doubt the same as those found commonly in southern Arizona and southern Utah and generally but wrongly labeled as *inornata* in collections.

The true *inornata* of which I have seen a specimen is very close to *cribraria,* only differing by having the legs and body beneath blue whereas they are unicolorous bronze black in the other. Dr. H. C. Fall, who has very carefully examined the Rogers' types which are at Harvard, for me, also believes that *cribraria* and *inornata* are but color varieties of *auripennis.* The deep blue or violet unicolorous phase which seems to be restricted to Arizona, southern Utah and perhaps western New Mexico, has been described as the variety *cyanea* by Schaeffer. I would place this as a subspecies of *auripennis,* for it is distinctly separated geographically, averages larger in size, has the prothorax proportionally broader, with the sides more parallel basally and less convergent anteriorly, the outer segments of the antennae more inclined to be cylindrical, less triangular, is of a duller aspect and uniformly of a unicolorous deep blue or violet color. The Utah specimens have the elytral punctures much finer than they are in the Arizona specimens. I have seen no intermediates between this subspecies and the true *auripennis* whereas all of the various bicolored phases or varieties grade one into another, besides appear to be almost entirely restricted to the territory east of the continental divide. Of this subspecies I have seen numerous specimens from St. George, Utah, and from Tucson, Pepper Lance, the Catalina and Chiricahua Mts. of Arizona, as well as a series of sixty-nine specimens in the collection of Owen Bryant, collected in the Santa Rita Mts. of Arizona, Oct. 15, 1936.

Chrysolina basilaris (Say)

Chrysomela basilaris Say, Descr. Col. Coll. in Exped. to Rocky Mts. under Maj. Long, Jour. Ac. N. S. Phila. III (1824), pp. 451–452.

Chrysomela montivagans Lec., Col. Alpine Regions of the Rocky Mts., II, Bull. U. S. Geol. and Geogr. Survey IV, 1878, p. 463.

Of moderate size, oval, convex, with imperfectly developed wings, dull sericeous above as the result of the pronounced alutaceous surface, color varying from blue-black to green. Head rather sparsely, finely punctured above, more coarsely and densely punctured on clypeus, frontoclypeal suture distinct and deeply impressed, frontal impression also generally distinct in front as well as markedly impressed; antennae somewhat robust, extending at least three segments beyond hind margin of prothorax, segments 1–6 longer than broad (second barely so), the following more robust, 7–10 transverse and very little narrower than broad. Prothorax one third broader than long, base arcuate at middle, apex also very feebly arcuate when seen from above, lateral grooves well impressed and complete though not sharply defined as in *cupripennis* and coarsely, irregularly punctured, the sides convex and prominent though not as much elevated as in *cupripennis,* the margin broadly arcuate, disk rather finely, somewhat densely punctured. Elytra one sixth longer than broad, striae not defined, the punctuation moderately coarse, somewhat dense, and very irregular, only occasionally can the regularity of the strial punctures on the disk be observed. Beneath finely, sparsely punctured. Length 6–8 mm., breadth 4–5 mm.

This species is quite distinct, its compact form, imperfect wings, well rounded sides of prothorax, robust antennae, rather densely, irregularly punctured elytra and uniform coloration enabling it to be readily separated from any of the other North American species.

Chrysolina basilaris (Say), as indicated by Schaeffer, has long been misunderstood. Say's original specimen came from the old Arkansas Territory, "Inhabits Arkansas . . . I obtained this specimen from near the Rocky Mountains," which no doubt would mean eastern Colorado as we know it today. Say's description was very poor in that he did not mention many of the most distinctive features, but he did call the "Body green," "antennae black, basal joint rufous," "lateral margin (of thorax) much thickened," and state that the elytra had "irregularly scattered punctures." There is only one all green species of the genus in this country, and that species has also all of the diagnostic characters mentioned by Say. This species is to be found in the high Rocky Mountains of Wyoming and Colorado, and it is also but a green phase of what was later on described as *montivagans* by LeConte from the blue phase. I have collected fifteen specimens of the green or typical *basilaris* from above timber line on Long's Peak, Col., July 9, 1926, and two more from above Monarch Pass, Col., in July, 1934, and have had five more recently submitted to me for study which were collected from beneath stones as were mine, on Mt. Washburn, Yellowstone National Park, at 10,317 ft. alt., by Kenneth Maehler. Of the blue phase the variety *montivagans* Lec., LeConte's type specimen was from Mt. Lincoln, Colorado (10,000–13,000 ft. alt.). Wickham in his List of Colorado Coleoptera, lists the following localities: Pikes Peak, Argentine Pass, Leavenworth Valley, all with Mt. Lincoln being Bowditch citations. In addition Wickham gives Custer Co. (Cockerell). In the Leng collection are two specimens merely marked "Col., 7, 89," probably all collected by Bowditch while in the Fenyes' collection are four specimens, all tagged "Middle P. Col., Dury." I have collected three typical blue-black specimens, two from above timber line, about 11,000 ft. alt., on Long's Peak, Col., more or less closely associated with the green phase which I collected at the same time, and one from the Twin Sisters, a peak directly opposite Long's Peak, during July, 1926.

Chrysolina subopaca (Rogers)

Chrysomela subopaca Rogers, Synopsis of Chrysomelidae of United States, Proc. Ac. N. S. Ac. Phil., 1856, p. 36.

Chrysomela opacipennis Cr., err. typ., Material for the Study of Phytophaga, Proc. Ac. N. S. Phil., XXV, 1875, pp. 50–51.

Moderately large, broadly oval, robust, very convex, unicolored bronze or feebly violaceous above or bronzed with head, antennae and margins of prothorax slightly violaceous, the undersurface and legs also generally violaceous and tarsi a bit bluish, the upper surface also minutely alutaceous and dull. Head finely, sparsely punctured, more closely in front especially on clypeus, fronto-clypeal and frontal sutures distinct and well impressed; antennae with last segment alone projecting beyond hind margin of prothorax, all segments longer than broad, the outer somewhat more robust and at least twice as long as broad. Prothorax about twice as broad as long, base broadly arcuate at middle, apex transverse at middle as seen from above, lateral grooves deep and complete and coarsely, irregularly punctured, the sides wide and convex, disk finely, sparsely punctured. Elytra about .5 mm. longer than wide. Striae not impressed, strial punctures rather coarse, at times regularly arranged on disk, at other times irregular and mixed with the more numerous interstrial punctures which are very variable as to size, sometimes minute, in which cases the strial punctures are apt to be regular in arrangement and thus stand out while in the larger and more robust specimens the interstrial punctures are numerous, to a great extent as coarse as the strial and both irregularly disposed. Beneath finely, sparsely punctured. Length 6.5–10 mm., breadth 5–7 mm.

This species stands out because of its robustness, its marked elytral convexity, its great breadth, its dull more or less unicolorous bronze color, its generally rather dense and irregular punctuation and its short antennae. It is the only species which is to be found on the Atlantic Seaboard and Southeast and seems with the exception of being found in Texas, to be restricted to the country east of the Mississippi River. Rogers gives the "Middle States" as the type locality. Leng in his catalogue gives "N. Y., Fla., Tex., Ind." Blatchley records it from southern Indiana and Florida, in the latter state listing it as taken in the adult state on cacti and thistles and citing Watson for a record on rape. Other records known are Lawrence Co., Ark. (Marshall Coll.) in Calif. Acad. of Sci. Coll., N. C. and Peekskill, N. Y., in the Leng collection. This last record is important in that Leonard in his "List of Insects of New York, 1928," states that "This is reported by Rogers as occurring in N. Y., but apparently this report is doubtful, as no specimens seem to have been taken by anyone else." Peekskill was the home and boyhood collecting ground of John D. Sherman, Jr., no doubt the collector of the specimen.

Boreaphilus americanus Notman.—A single specimen of this peculiar looking Staphylinid was taken by sifting leaves, debris and dead hummock grass at the edge of a small swamp near the outlet of Lake Cochituate, Natick, Mass., on October 31, 1937. It was identified through the kindness of Mr. H. C. Fall to whom I have given the specimen.—C. A. FROST, Framingham, Mass.

THE THREE EUMENES OF CANADA AND THE NORTHEASTERN UNITED STATES; WITH NOTES ON OTHER NORTH AMERICAN SPECIES (HYMENOPTERA; VESPIDAE).

By J. Bequaert, Museum of Comparative Zoölogy,
Cambridge, Mass.

Strange as it may seem, the three species of *Eumenes* commonly found in the northeastern United States and Canada, cannot be readily named with the available literature. The only serious attempt to distinguish between them was by Isely (1917, Ann. Ent. Soc. America, X, pp. 345–366). Although he correctly recognized the species, his key will hardly separate them in all cases.

The origin of the confusion appears to have been de Saussure's failure to recognize *Eumenes verticalis* Say, specimens of which he evidently included among his *E. globulosus* in the "Synopsis of American Wasps" (1875, Smithson. Miscell. Coll., No. 254, p. 101).

The subjoined key includes the most reliable features separating *E. fraternus, E. globulosus* and *E. verticalis.* Color characters are given more prominence in this key than has been my custom. Nevertheless, the species are distinct in structure, more particularly in the shape of the terminal hook-like segment of the male antenna. This, being difficult to describe in a few words, is shown in *camera lucida* drawings. The puncturation of the second tergite is far less reliable and should be disregarded if it clashes with other characters.

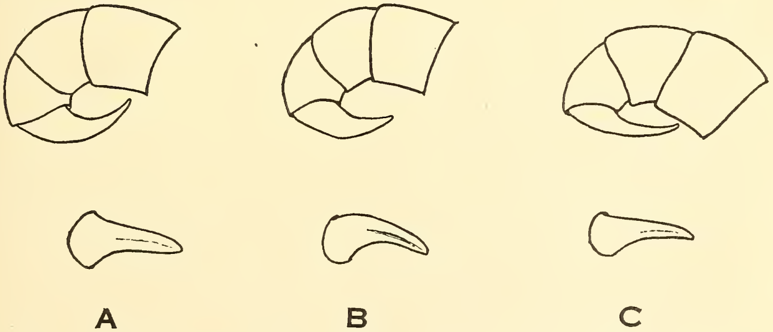

Fig. 1. Tip of left male antenna in upper side view and outer or dorsal view of terminal hook: A, *Eumenes fraternus* Say; B, *E. globulosus* de Saussure; C, *E. verticalis* Say.

The nomenclature and synonymy of the three species cannot yet be settled with absolute certainty. The names *fraternus* Say and *verticalis* Say are most probably used as originally meant. There is some uncertainty as to what exactly was de Saussure's *globulosus,* the type of which appears to be lost. Moreover, that name may have to be replaced by the earlier *E. macrops* de Saussure when the type of this can be more carefully studied. *E. minuta* de Saussure (1852), from North America, was either *verticalis* or *globulosus,* probably the latter. The name is preoccupied by *E. minuta* Fabricius (1804), a South American wasp not related to the forms here discussed.

Specimens were examined from the American Museum of Natural History, the Museum of Comparative Zoölogy, the United States National Museum, the Oregon State Agricultural College, the Boston Society of Natural History, the Philadelphia Academy of Natural Sciences, and several other public and private collections.

The distribution of the three species is distinctive, although the ranges overlap to some extent. In certain localities, for instance of New York State, all three may be taken together, apparently under the same ecological conditions. *E. fraternus* covers the eastern United States from the Great Lakes to Florida, westward to Kansas, Oklahoma and Texas; it inhabits mainly the Carolinian and Austroriparian Zones. *E. verticalis,* on the whole more northern than *fraternus,* is known from Ohio, Ontario and Massachusetts to North Carolina, primarily in the Transition Zone. *E. globulosus* is the most boreal of all and occurs from Coast to Coast, as well as in the Rocky Mountain region; it reaches the highest latitude of any American *Eumenes* (Ft. Macleod, 55° N., 123° W.), and covers part of the Canadian as well as most of the Transition Zones.

Key to Species.

1. Body markings bright yellow; tibiae and tarsi somewhat blotched with russet; second tergite with a free, narrow, linear spot on each side. Wings subhyaline or very slightly smoky, a little darker anteriorly. First abdominal segment slightly shorter than thorax, intermediate in shape between that of *E. fraternus* and *E. globulosus* (shorter than in *fraternus,* narrower than in *globulosus*). Second tergite rather densely and coarsely punctate all over, usually as strongly as the first. Vertical slope of propodeum deeply grooved medially throughout. Clypeus of female elongate-hexagonal, with many deep and large punctures; free, apical portion shorter than upper, interocular part;

apical margin distinctly shorter than sides of free portion. Antennal hook of male slender, slightly curved, sharply pointed beyond base, finger-shaped; outer or dorsal surface quite narrow and very weakly ridged before apex. Smaller species (fore wing, 7.5 to 10 mm). *E. verticalis* Say.

Body markings white or creamy-white .... 2.

2. Larger species (fore wing, 7.5 to 13 mm.). Wings much infuscated, with a purplish tinge; often purplish-black. Tibiae and tarsi marked with white or creamy-white. First abdominal segment rather slender, seen from above as long as thorax; widened posterior part of first tergite about one and one-half times as long as wide at apex, passing fairly gradually into the stalk-like base. Second tergite rather finely and not closely punctate. Vertical slope of propodeum deeply grooved medially throughout. Clypeus of female elongate-hexagonal, with many deep and large punctures; free, apical portion much shorter than upper, interocular part; apical margin as long as sides of free portion. Antennal hook of male claw-shaped, with a rather thick basal half which gradually narrows into a sharp apex; outer or dorsal surface fairly wide, straight and bluntly ridged over apical half. *E. fraternus* Say.

Smaller species (fore wing, 7 to 11 mm.). Wings subhyaline or slightly cinerous, usually with a fuscous or yellowish area along the costal margin. Tibiae and tarsi generally blotched with russet. First abdominal segment decidedly stouter than in the other two species, shorter than the thorax in profile; seen from above, the widened, posterior part scarcely longer than wide at apex and passing rather abruptly into the basal stalk. Second segment relatively short and swollen, more globular than in *E. fraternus;* the tergite usually finely and sparsely punctate. Propodeum more evenly sloping throughout, the median groove rather shallow, deeper in lower third only. Clypeus of female almost regularly hexagonal, with scattered and rather fine punctures; free, apical portion nearly as long as basal, interocular part; apical margin shorter than sides of free portion. Antennal hook of male claw-shaped, shorter and somewhat less curved than in *E. fraternus* and more swollen basally; outer or dorsal surface

slightly curved, with a formal carina which begins before the middle and stops before the apex.
E. globulosus de Saussure.

Eumenes fraternus Say.

Eumenes fraterna Say, 1824, in Keating, Expedition to the Source of the St. Peter's River (Philadelphia Edition), II, p. 344 (no sex; "Pennsylvania; N. W. Territory [=Ohio and Indiana]; Missouri"); 1825, *Op. cit.*, (London Edition), II, Appendix p. 76.

Eumenes fervens H. de Saussure, 1852, Et. Fam. Vesp., I, p. 40 (♀♂, in part: Carolina, ♀; New Orleans, ♂; the variety from Hudson's Bay was almost certainly *E. globulosus*).

Say's types are no longer in existence. The Harris Collection, at the Boston Museum of Natural History, contains two males and one female, from Massachusetts, named "*Eumenes fraterna*" after Say's identification of similar specimens, but not seen by him. They agree with the present concept of the species and might claim to be "neotypes" on much better grounds than any other arbitrarily selected specimens.

In 1852, de Saussure (p. 41) stated expressly that he saw neither *E. fraternus* nor *E. verticalis*. Yet in the same work he figured (Pl. XI, fig. 8) a female called "*Eumenes fraterna*" in the explanation of the plate and on p. 280 (both published much later than the text proper). This appears to be true *E. fraternus*, even though the markings are painted dark yellow instead of creamy-white. No type of *E. fervens* is to be found at the Paris Museum, Mr. L. Berland writes me. Perhaps it is at the Geneva Museum. The original name label may, however, have been removed by de Saussure himself, after he recognized *fervens* as a variation of *E. fraternus* (1856, Et. Fam. Vesp., III, Suppl., p. 130).

I have seen specimens from New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Washington, D. C., Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Oklahoma (Grove; Nashoba; Stillwater; Millerton; Broken Bow; Page), Kansas, Missouri, Arkansas, West Virginia, Ohio, Indiana, Illinois, Iowa, Wisconsin, and Michigan; also a few specimens labelled "Canada." It probably occurs in Kentucky and Tennessee and it should be looked for in Minnesota and the eastern parts of the Dakotas. The northernmost locality known to me is in Michigan (Midland Co.). In Canada it has been reported from southern Ontario.

Isely's record of *E. fraternus* from West Cliff, Custer Co., Colorado, is based upon an old specimen from the Ashmead collection, perhaps collected by Cockerell. While it is true *fraternus,* some error in labelling might have occurred. I have never seen the species in the several large collections of Eumeninae studied from Colorado. It probably does not occur west of the 100th Meridian, nor south of 20° N.

The nest and habits of *E. fraternus* have been often described, beginning with Say himself.

Eumenes globulosus de Saussure.

?*Eumenes macrops* H. de Saussure, 1852, Et. Fam. Vesp., I, p. 41 (no sex; "north Carolina").

Eumenes globulosus H. de Saussure, 1856, Et. Fam. Vesp., III, Suppl., p. 139 (♀; "North America").

?*Eumenes minuta* H. de Saussure, 1852, Et. Fam. Vesp., I, p. 39 (♂; "North America"). Not of Fabricius, 1804.

E. globulosus was originally described from a specimen sent by F. Smith. Mr. O. W. Richards writes me that this type does not appear to be now at the British Museum, and I could not find it there in 1928. It is probably lost, unless de Saussure retained it for his own collection. The use of the name "*globulosus*" for the species as defined in my key, is based upon the account of the first abdominal segment in the original description: "pétiole court, fortement campanulé, avec une dépression dorsale à son bord postérieur, et portant deux tubercules au milieu;" and of the wing: "Ailes transparentes, un peu ferrugineuses le long de la côte." H. de Saussure's more detailed account of 1875 (Smithson. Miscell. Coll., No. 254, p. 101) does not help, being clearly based upon a mixture of *globulosus* and *verticalis.*

The type of de Saussure's *E. minuta,* although described from the Paris Museum, could not be found there by Mr. L. Berland. The description agrees best with *E. globulosus.*

The holotype of *E. macrops,* at the British Museum, is a male labelled "Warm Springs, North Carolina (E. Doubleday)." I examined it in 1928 and concluded that it was extremely close to, if not identical with, *E. globulosus* (1928, Ann. Mag. Nat. Hist., [10], II, p. 161). The wings are but slightly smoky, almost clear; the body-markings are creamy white and the legs more or less tinged with ferruginous; there is a creamy white dot about the middle on each side of the first tergite (or petiole); but there are no lateral spots on the second tergite and the tergites 3 to 7 are without apical fasciae. Since I did not seem to have made a direct comparison of specimens, I have asked Mr. O. W. Richards to compare the type of *macrops* with males of the only four species of

Eumenes known from the eastern United States (including the more southern *E. smithii* de Saussure). Unfortunately, Mr. Richards was unable to refer *macrops* with certainty to any of the four species, so that the matter must be left undecided for the time being. Nevertheless, I feel that, unless the locality label was erroneous, *E. macrops* was based upon an unusually dark specimen of *E. globulosus.* I have seen specimens of this species with lateral spots on the first tergite and some males in which the spots on the disk of the second tergite were quite small.

I have studied specimens from Maine (Southport; Wissataquoik River; Waldoboro; Brunswick; Orono; Little Deer Island), New Hampshire (Lynne; Holderness; Pelham; Durham), Vermont (Chittenden; Fairlee), Massachusetts (Boston; Milton), Connecticut (Redding; Colebrook), New York (N. Y. City; McLean; Potsdam; White Lake; Oliverea, Catskills; Keene Valley; Chazy; Buffalo; etc.), New Jersey (Duttonville; Ramsey; Great Piece Meadow), Ohio (Georgesville; Put-in-Bay), Indiana, Michigan (Midland Co.; Isle Royale), Wisconsin (Cranmoor), Kentucky, Minnesota (Moorhead), Colorado (Long Peak Inn; Granite Peaks Camp near Bayfield), Idaho (Moscow Mt.; Spirit Lake), Oregon (Antelope Mt., Harney Co., 6,500 ft.), Washington State (Anacortes), British Columbia (Kaslo; Ft. Macleod), Alberta (Fawcett; Slave Lake; Frank; Edmonton; Consort; Bilby; Gull Lake; Beaver Lodge), Manitoba (Cedar Lake; Winnipeg), Ontario (Gravenhurst, Muskoka Distr.), Quebec (Montreal), New Brunswick (St. John; Nerepis), and Nova Scotia (Weymouth; Baddeck, Cape Breton).

The nest of *E. globulosus* has not been described thus far.

Eumenes verticalis Say.

Eumenes verticalis Say, 1824, in Keating, Expedition to the Source of the St. Peter's River (Philadelphia Edition), II, p. 346 no sex ("Pennsylvania"); 1825, *Op. cit.* (London Edition), II, Appendix, p. 78.

Say's type is no longer in existence.

I have seen specimens from Massachusetts (Forest Hills; Middlesex Fells), Connecticut (Sound Beach), New York (Roslyn, Long Island; Oswego; White Plains; Rockaway Beach; Buffalo), New Jersey (Ramsey; Milburn; Lake Hopatcong), Pennsylvania (Philadelphia; Rockville), Delaware, Maryland (Beltsville; Indian Hill), Washington, D. C., Virginia (Falls Church; Glencarlyn), North Carolina (Valley of Black Mts.), Ohio (Put-in-Bay), Indiana, Wisconsin (Polk Co.), Missouri, North Dakota (Dickinson), South Dakota (Volga), and Ontario (Pelée Island).

The specimen from West Cliff, Custer Co., Colorado, recorded by Isely under *verticalis,* could not be found under that species at the U. S. Nat. Mus. It was most probably *E. coloradensis* Cresson, which is perhaps only a variety of *verticalis.*. In Maryland and Virginia *verticalis* is often more profusely marked with yellow than farther north.

Isely separates *fraternus* and *verticalis* as follows:

Petiole pyriform, widest at apical margin, more heavily punctate than the second segment of the gaster; markings yellowish-white; no dots on either side of the petiole . . *fraternus.*

Petiole campanulate, widest before apical constriction, as heavily punctate as the second segment; markings of bright yellow; a dot on either side of the petiole . . . . *verticalis.*

I am unable to appreciate the difference in the outline of the petiole (first tergite) in all my specimens. The puncturation varies, some specimens of *fraternus* and *verticalis* hardly differing in this. Only three (♀) of 15 specimens of *verticalis* seen have lateral dots on the petiole; they are absent in most *fraternus,* but they occur in some specimens (f. i. in a ♀ from East Lansing, Michigan). Moreover, Isely himself describes a variety of *fraternus* with a dot on either side of the petiole.

The nest of *E. verticalis* is as yet unknown.

Eumenes brunneus Isely.

Eumenes brunneus Isely, 1917, Ann. Ent. Soc. America, X, p. 348 (♂; Colorado).

This species is known only from the type, which I have examined at the U. S. Nat. Museum. It is very close to *E. belfragei* Cresson, from which it differs mainly in lacking the pinched median depression before the apex of the second tergite, which also is more finely punctate. The dorsal flattening of the head is by no means as definite a character as Isely's key might lead one to think. I should not be surprised if this male were eventually recognized as merely a somewhat aberrant *E. belfragei.* For this reason I refrain from renaming it, on account of the earlier *Eumenes brunnea* Spinola (1851, Mem. Accad. Sci. Torino [2], XIII, Sci. Fis. Mat., p. 82), which, moreover, is perhaps only a *nomen nudum.*

Eumenes bollii Cresson.

Eumenes bollii Cresson, 1872, Trans. Amer. Ent. Soc., IV, p. 232 (♀♂; Texas; since the types were collected by Belfrage, they were taken in Bosque Co.).

I have examined the types at the Ac. Nat. Sci. Philadelphia.

They are extensively marked with ferruginous, notably on the first tergite. This typical form I have seen from Texas (Austin; Sheffield, Pecos Co.; Canadian; Del Rio; Ft. Stockton), New Mexico, Kansas, Colorado (Clear Creek, Jefferson Co., 6,000 to 7,000 ft), Arizona, Nevada, California (Jacumba, San Diego Co.; Antioch, Contracosta Co.), and Washington State (Wawawai, Whitman Co.).

Like many other widely distributed western Vespidae it produces in the Pacific Northwest a melanic variety, described below.

E. bollii var. **oregonensis,** new variety.

> *Female.*—Black, with the ferruginous markings much reduced, almost lacking on abdomen (except for a narrow side margin of second tergite connecting the apical and basal yellow areas); on the thorax the ferruginous color covers most of pronotum (a blackish spot near wing), tegulae and sides of propodeum, and suffuses the yellow of scutellum and mesopleural spot; most of scape, basal third to half of flagellum, most of mandibles, apical half to two-thirds of femora and under side of tibiae and tarsi, also ferruginous. Clypeus, interantennal carina, lower inner orbits (not reaching bottom of ocular sinuses), upper outer orbits, anterior margin of pronotum (narrowly at the sides, very broadly in the center), scutellum, postscutellum, small spot on upper plate of mesopleura, narrow apical margin of first tergite, a broad helmet-shaped spot on apical half and two large lateral free spots near the base of second tergite, most of apical third of second sternite, most of succeeding segments, and most of tibiae and tarsi, bright saffron yellow. Wings moderately infuscated throughout, with a distinct purplish sheen, more russet at base; veins and stigma brownish-black, costa ferruginous.

In size, structure, sculpture and pubescence like typical *E. bollii* Cresson.

Holotype, female, Wawawai, Whitman Co., Washington State, June 6, 1908, together with typical *bollii* (W. M. Mann). Museum of Comparative Zoölogy, Cambridge, Mass.

Paratypes: Female, Blitzen, Harney Co., 4,000 ft., Oregon, August 3, 1932 (H. A. Scullen.—Oregon State Agricultural College, Corvallis, Oregon); female, Fallon, Churchill Co., 4,000 ft., Nevada, June 6, 1930 (E. L. Bell.—Am. Mus. Nat. Hist.).

Eumenes crassicornis Isely.

Eumenes crassicornis Isely, 1917, Ann. Ent. Soc. America, X,

p. 362 (♂; holotype, Goldstream, British Columbia; paratype, Seattle, Washington).

Eumenes pachygaster Isely, 1917, Ann. Ent. Soc. America, X, p. 362 (♀; holotype and paratypes, Mountain View, Santa Clara Co., California; paratype, Menlo Park, San Mateo Co., California).

After a comparative study of the types, as well as of other material, it appears that *crassicornis* and *pachygaster* were based upon the two sexes of one species. The name *crassicornis* precedes *pachygaster* on the page.

The thorax of *crassicornis* is very coarsely sculptured and the mesonotum bears, in front of the scutellum, two short but deep longitudinal depressions, apparently corresponding to the notaulices. These are absent or barely indicated in most other North American species of *Eumenes.*

As pointed out by Isely, the yellow markings are more reduced in this species than usual. They are, moreover, somewhat variable. In all four females seen (besides the types), the scape is black and there is no vertical yellow line between the antennal sockets; the oblique yellow, free streak of the second tergite is complete in one, but broken up in the others. In one male, the free yellow dots of the second tergite are entirely lacking. In coloration *E. crassicornis* is much like *E. globulosiformis* Viereck, a species which, however, is structurally quite different.

I have seen specimens from California (♀, Alta Meadow, Tulare Co., 8,000 ft.), Oregon (♀, Lucky Boy Camp, Blue River, Lane Co.; ♀, Lake of Woods, Klamath Co., 4,950 ft.; ♀, Breitenbush Hot Springs, Marion Co., 2,222 ft.), Idaho (♂, Priest Lake, 4-Mile Camp, Bonner Co.), and Montana (♂, Moose Lake, Ravalli Co.).

Eumenes globulosiformis Viereck.

Eumenes globulosiformis Viereck, 1908, Trans. Amer. Ent. Soc., XXXIII, p. 386 (♀♂; Thomas Ranch, Oak Creek Canyon, 20 miles southwest of Flagstaff, Coconino Co., 6,000 ft., Arizona).

This species was not recognized by Isely. It agrees with *E. crassicornis* in the much reduced yellow markings, as well as in the swollen, compressed and almost humped second abdominal segment. The scape is entirely black in both sexes. The yellow spots on the dorsal lateral areas of the propodeum may be present or absent. The yellow free dots of the first tergite are lacking in four specimens (1 ♀, 3 ♂), just barely indicated in two (1 ♀, 1 ♂). Of six specimens studied, two males lack every trace of a free spot on the second tergite, three (1 ♀ and 2 ♂) have a bare indication of a yellow dot on one side of the body only, and one female has a narrow yellow free line on each side. All the males have the clypeus partly black, but the extent of yellow varies.

Structurally *globulosiformis* differs from *crassicornis* in the slender antennae of both sexes, as well as in the barely indicated notaulices of the mesonotum. The preapical thickening of the second tergite is also more pronounced and the apical lamella beyond is somewhat reflexed, the two forming a deep groove.

I have taken this species in the Pinaleño Mts. (Post Creek Canyon, Fort Grant) and Sta. Catalina Mts. (Mt. Lemmon) of Arizona, at altitudes of 5,500 to 6,500 ft.

Eumenes pedalis Fox.

Eumenes pedalis Fox, 1894, Proc. California Ac. Sci., (2), IV, p. 109 (♀♂; El Taste, 4,200 ft.; San José del Cabo; both in Lower California, Mexico).

The holotype, of the California Academy of Sciences, is destroyed. There are, however, two "cotypes," part of the original lot, at the Academy of Natural Sciences, Philadelphia. According to these, the species is exceedingly close to *E. coloradensis* Cresson, and, like this, perhaps only a color variation of *E. verticalis* Say.

NAMES PROPOSED FOR NORTH AMERICAN EUMENES.

agilis (*Eumenes*) H. de Saussure, 1852, Et. Fam. Vesp., I, p. 42 (♂; "Amérique"). Type probably at Paris Museum. Not recognized, but possibly South American.

aureus (*Eumenes belfragei* subsp.) Isely, 1917, Ann. Ent. Soc. America, X, p. 352 (♀; Brewster Co., Texas). Type at U. S. National Museum.

belfragei (*Eumenes*) Cresson, 1872, Trans. Amer. Ent. Soc., IV, p. 232 (♀♂; Bosque Co.; Dallas Co.; Travis Co.; and Bastrop Co.; all in Texas). The ♀ holotype, at Academy Nat. Sci., Philadelphia, is labelled "Texas" only.

bolliformis (*Eumenes, Pachymenes*) Viereck, 1908, Trans. Amer. Entom. Soc., XXXIII, p. 387, fig. (♀♂; Thomas' Ranch, Oak Creek Canyon, 6,000 ft., 20 miles S. W. of Flagstaff, Arizona). This is a true *Eumenes,* not a *Pachymenes.* Type at University of Kansas.

bollii (*Eumenes*) Cresson, 1872, Trans. Amer. Ent. Soc., IV, p. 232 (♀♂; Bosque Co., Texas). Types at Academy Nat. Sci., Philadelphia.

brunneus (*Eumenes*) Isely, 1917, Ann. Ent. Soc. America, X, p. 348 (♂; Colorado). Not *Eumenes brunnea* Spinola, 1851. Type at the U. S. National Museum.

coloradensis (*Eumenes*) Cresson, 1875, Rept. Geogr. Geol. Expl. Surv. 100th Merid., V, p. 717 (♀♂; Colorado). Types at Academy Nat. Sci., Philadelphia.

crassicornis (*Eumenes*) Isely, 1917, Ann. Ent. Soc. America, X, p. 362 (♂; Goldstream, British Columbia [type]; also Seattle, Washington). Type at U. S. National Museum.

crucifera (*Eumenes*) Provancher, 1888, Addit. Faune Canada, Hymén., p. 421 (♀♂; Los Angeles, California). Type at U. S. National Museum (acc. to Isely).

cruciferorum (*Eumenes, Alpha*) Viereck, 1908, Trans. Amer. Ent. Soc., XXXIII, p. 388 (♀♂; Thomas' Ranch, Oak Creek Canyon, 6,000 ft., 20 miles S. W. of Flagstaff, Arizona). Types at University of Kansas.

enigmaticus (*Eumenes, Alpha*) Viereck, 1908, Trans. Amer. Ent. Soc., XXXIII, p. 389 (♂; Thomas' Ranch, Oak Creek Canyon, 6,000 ft., 20 miles S. W. of Flagstaff, Arizona). Type at University of Kansas.

fervens (*Eumenes*) H. de Saussure, 1852, Et. Fam. Vesp., I, p. 40 (♀♂; Carolina; New Orleans; and Hudson Bay). Type possibly at Geneva Museum.

fraterna (*Eumenes*) Say, 1824, in Keating, Expedition to the Source of the St. Peter's River (Philadelphia Edition), II, p. 344 (no sex; Pennsylvania; N. W. Territory [= Ohio and Indiana]; Missouri); (London Edition, 1825, II, Appendix, p. 76). Type lost.

globulosiformis (*Eumenes, Alpha*) Viereck, 1908, Trans. Amer. Ent. Soc., XXXIII, p. 386 (♀♂; Thomas' Ranch, Oak Creek Canyon, 6,000 ft., 20 miles S. W. of Flagstaff, Arizona). Types at the University of Kansas.

globulosus (*Eumenes*) H. de Saussure, 1856, Et. Fam. Vesp., III, Suppl., p. 139 (♀; North America, without more definite locality). Location of type unknown; possibly lost.

macrops (*Eumenes*) H. de Saussure, 1852, Et. Fam. Vesp., I, p. 41 (no sex; North Carolina). Type at British Museum.

marginilineatus (*Eumenes, Alpha*) Viereck, 1907, Trans. Amer. Ent. Soc., XXXIII, p. 381 (♂; Este's Park, Larimer Co., Colorado). Type at University of Kansas.

minuta (*Eumenes*) H. de Saussure, 1852, Et. Fam. Vesp., I, p. 39 (♂; North America). Not *Eumenes minuta,* Fabricius, 1804. Type apparently lost.

oregonensis (*Eumenes bollii* var.) J. Bequaert. See this paper.

pachygaster (*Eumenes*) Isely, 1917, Ann. Ent. Soc. America, X, p. 362 (♀; Mountain View, Santa Clara Co., California [type];

also Menlo Park, San Mateo Co., California). Type at U. S. National Museum.

pedalis (*Eumenes*) Fox, 1894, Proc. California Ac. Sci., (2) IV, p. 109 (♀♂; El Taste and San José del Cabo, Lower California, Mexico). Type destroyed; "cotypes" at Ac. Nat. Sci., Philadelphia.

[*pensilvanica* (*Eumenes*) Haldeman, 1853, Proc. Ac. Nat. Sci. Philadelphia, VI, p. 365 (no sex; Pennsylvania) = *Zethus spinipes* Say, 1837].

robustus (*Eumenes*) Isely, 1917, Ann. Ent. Soc. America, X, p. 360 (♀, Beulah, San Miguel Co., New Mexico; ♂, Williams, Coconino Co., Arizona; also from Fort Collins, Colorado and from Oregon). Types at U. S. National Museum.

smithii (*Eumenes*) H. de Saussure, 1852, Et. Fam. Vesp., I, p. 43, Pl. X, fig. 1 (♀♂; Florida). Types at Paris and British Museums.

stenogaster (*Eumenes*) Isely, 1917, Ann. Ent. Soc. America, X, p. 353 (♀, Rio Ruidoso, White Mts., New Mexico; ♂, Beaver Canyon, Utah). Types at U. S. National Museum.

sternalis (*Eumenes*) Isely, 1917, Ann. Ent. Soc. America, X, p. 353 (♀, Beaver Canyon, Utah; ♂, New Mexico). Types at U. S. National Museum.

[*substricta* (*Eumenes*) Haldeman, 1844, Proc. Ac. Nat. Sci. Philadelphia, II, p. 54 (no sex; no locality, but from North America) = *Zethus spinipes* Say, 1837].

tricinctus (*Eumenes*) Isely, 1917, Ann. Ent. Soc. America, X, p. 361 (♀; Oregon [type]; and Los Angeles Co., California). Type at U. S. National Museum.

verticalis (*Eumenes*) Say, 1824, in Keating, Expedition to the Source of the St. Peter's River, (Philadelphia Edition), II, p. 346 (no sex; Pennsylvania); (London Edition, 1825, II, Appendix, p. 78). Type lost.

xanthogaster (*Eumenes*) Isely, 1917, Ann. Ent. Soc. America, X, p. 359 (♂; Los Angeles Co., California). Type at U. S. National Museum.

Silpha americanus Linn.—A specimen of this common species was taken in the act of feeding on the pollen of *Solidago* flowers at Malden, Mass., on August 12, 1917. This seems to be the most peculiar record on my long list of anthophilous beetles.—C. A. FROST, Framingham, Mass.

NEW OR INSUFFICIENTLY-KNOWN CRANE-FLIES FROM THE NEARCTIC REGION (TIPULIDAE, DIPTERA). PART IV.

By Charles P. Alexander, Amherst, Mass.*

The preceding instalment under this general title was published in 1931 (Bull. Brooklyn Ent. Soc., 26: 177–184). Except where stated to the contrary, the types of the novelties herewith described are preserved in my collection, through the friendly interest of the various collectors.

Tipula (Lunatipula) leechi n. sp.

Allied to *macrolabis;* ground-color of mesonotum and pleura light yellow, the praescutum with four narrow bright brown stripes; ground-color of wings light yellow, with a restricted brown pattern; male hypopygium large, the lateral arms of basistyle very stout, with more than the outer half slightly expanded, the dorsal face with a weak carina that extends to apex of arm, making it appear more or less pointed.

Male.—Length about 20 mm.; wing 21 mm.

Frontal prolongation of head brownish ochreous, nasus distinct; basal segment of palpus obscure yellow, the remainder passing to brownish black. Antennae with the basal four segments yellow, the succeeding segments bicolorous, yellow, the basal enlargement brown; outer segments somewhat more uniformly darkened. Head light yellow in front, light brown on posterior vertex.

Mesonotal praescutum with the ground-color light yellow, with four narrow, bright brown stripes, the intermediate pair separated by a ground line nearly as wide as either stripe; each scutal lobe with two small pale brown areas; posterior sclerites of notum and the pleura chiefly yellow pollinose, the scutellum and mediotergite with a vague capillary median dark line. Halteres yellow, the knobs dark brown. Legs with the coxae and trochanters yellow; femora reddish yellow, the tips narrowly darkened; tibiae obscure yellow; tarsi passing into dark brown; tibial spur formula 1–2–2; claws simple. Wings with the ground-color light yellow, the prearcular and costal regions deeper yellow; a restricted brown and whitish pattern; the pale brown areas are evident chiefly as clouds in the apical and caudal portions of wing; a series of four somewhat darker brown areas in anterior field of wing, these much smaller and less evident than in *macrolabis;* the whitish areas lie chiefly along both sides of cord and beyond the stigma. Squama with a few setae.

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* Contribution from the Department of Entomology, Massachusetts State College.

Abdomen yellow, the tergites very narrowly trivittate with dark brown, these delicate lines more or less interrupted at the caudal margins of the segments; extreme caudal and lateral margins of tergites pale; hypopygium large, chestnut-brown. Male hypopygium generally as in *macrolabis* but the lateral arms of basistyle very stout, with slightly more than the distal half a little dilated into a head, the dorsal face of the expanded portion with a gently curved carina that extends to the apex of the head, making it appear acute or subacute.

Habitat: British Columbia.

Holotype: ♂, Vancouver, July 11, 1930 (*Hugh B. Leech*).

Tipula (*Lunatipula*) *leechi* is named in honor of Dr. Hugh B. Leech, of the University of California, to whom I am indebted for numerous interesting species of Tipulidae. The fly is quite distinct from *T.* (*L.*) *macrolabis* Loew and *T.* (*L.*) *youngi* Alexander in the unusually stout lateral arm of the basistyle, with only the distal half weakly expanded. In *macrolabis,* the outer third of the arm is expanded into a flattened smooth paddle-like blade; in *youngi,* this blade is produced into two acute spinous points. *T.* (*L.*) *spectabilis* Doane has long been regarded as being identical with *macrolabis,* the structure of the male hypopygium being very similar in both flies; however, the mesonotum of *spectabilis* is more yellowish than in *macrolabis* and may be found to represent still another closely allied species in this group.

Pedicia (Pedicia) parvicellula n. sp.

Female.—Length about 29 mm.; wing 21.5 mm.

Size and general appearance about as in *P.* (*P.*) *margarita* Alexander (Eastern United States). Antennae darker brown throughout. Mesonotal praescutum with the ground-color buffy, with three slightly darker stripes, the median one vaguely divided by a capillary vitta. Postnotal mediotergite and pleurotergite dark brown. Femora obscure yellow, the tips narrowly and gradually infuscated, not abruptly blackened, as in *margarita.* Wings with the dark pattern as in *margarita,* the dark seam along vein *Cu* continued to margin; basal third of costal cell whitened. Venation: Cell M_1 very small, approximately one-third the length of its petiole. Abdominal tergites reddish brown, with a darker brown median stripe that is narrowly interrupted at the caudal margin of the segments; sternites uniformly reddish brown. Ovipositor with the cerci much longer than in *margarita,* very gently upcurved. The abdominal tergites entirely lack the contrasting pattern of reddish brown and whitish gray characteristic of the three species of Eastern North America, *albivitta* Walker, *contermina* Walker and *margarita* Alexander.

Habitat: British Columbia.

Holotype: Cypress Creek, Vancouver, August 16, 1931 (*Hugh B. Leech*).

I have little doubt but that this is the species that has been determined by Aldrich (Psyche, 7: 202; 1895) as *obtusa* Osten Sacken, from material taken at Lake Union, Seattle, Washington, in late August. His specimen, a male, agrees very closely with the type female described above (Male, length about 28 mm.; wing about 22 mm.). The specimen has the pattern of the abdominal tergites and the wing-markings quite as described above. Aldrich describes the male as having the styli of unusual length, being approximately twice that of *albivitta.* The unusually long cerci of the female of the present fly would seem to be correlated with this elongation of the male styli. *Pedicia obtusa* Osten Sacken (Bull. U. S. Geol. Survey, 3: 205–206; 1877) was provisionally defined from a specimen taken near Saucelito, Marin County, California, in the Spring. Later, Osten Sacken (Psyche, 7: 229–230; 1895) gave fuller notes on what would seem to represent this same species, taken in Siskiyou County, California, September 27 and October 6; all of these specimens show the dark seam along vein *Cu* ending at the level of the cord, quite as in the Eastern *contermina.* The species here characterized as new has this seam continued to the wing-margin. Although abnormal specimens of *Pedicia albivitta* and *P. rivosa* Linnaeus are occasionally found where there is a difference in the degree of extension of this seam, in large series of specimens it has proved to be a very constant character.

LIMNOPHILA Macquart.

Trichephelia n. subgenus.

Characters as in *Elaeophila* Rondani, differing especially in the possession of numerous coarse macrotrichia in apical cells of wing, from R_3 to M_3, inclusive. Male hypopygium with the apex of outer dististyle terminating in a long slender black spine.

Type of subgenus.—*Limnophila* (*Trichephelia*) *seticellula* n. sp. (Nearctic Region: Alleghenian Subregion).

Limnophila (Trichephelia) seticellula n. sp.

General coloration blackish, pruinose, the praescutal stripes more yellowish brown; antennal scape and pedicel brownish black, the flagellum paler; pleura with a black longitudinal stripe; wings yellowish, with a heavy dark brown pattern; apical cells of wing with conspicuous macrotrichia; male hypopygium with the outer dististyle terminating in a long acute spine, with a smaller lateral spine on outer margin at near four-fifths the length.

Male.—Length about 5 mm.; wing 5.5 mm.

Rostrum and palpi black. Antennae of moderate length, if bent backward extending about to wing-root; scape and pedicel brownish black, flagellum brownish yellow, the outer segments more uniformly darkened; verticils long and very conspicuous. Head blackish, sparsely pruinose.

Ground-color of mesonotum blackish, the praescutum almost covered by three more yellowish brown stripes that are confluent in front, restricting the ground-color to the posterior interspaces and narrow lateral margins behind the pseudosutural foveae; scutellum a little paler than the scutum or mediotergite. Pleura grayish brown, with a complete dorsal longitudinal black stripe, extending from the cervical region to the postnotum and surrounding the root of the halter; ventral sternopleurite blackened. Halteres obscure yellow, the knobs infuscated. Legs with the coxae obscure yellow, the fore coxae darker; trochanters yellow; femora testaceous yellow, the tips blackened; tibiae similar, the tips more narrowly darkened; tarsal segments chiefly obscure yellow, the tips of the individual segments weakly infuscated; legs conspicuously hairy. Wings tinged with yellow, the anterior half somewhat clearer yellow; a heavy, dark brown pattern, including a series of seven costal areas, the third at origin of *Rs*, the fifth stigmal; other clouds along cord, outer end of cell *1st* M_2, fork of M_{1+2}, at supernumerary crossvein in cell *M*, and with smaller spots at ends of all longitudinal veins with the exception of R_{4+5}, these becoming progressively larger toward the wing-base; a cloud on vein *Cu* just beyond its origin; veins pale, darker in the clouded areas. Macrotrichia in apical cells of wing, as defined under the subgenus. Venation: Sc_1 ending shortly before fork of *Rs*; *m–cu* at about one-third the length of the relatively small cell *1st* M_2; cell M_1 subequal to its petiole.

Abdomen black, the hypopygium more brownish yellow.

Male hypopygium with the outer dististyle a heavily blackened slender structure, strongly curved to the acute apical spine; on lateral margin at near four-fifths the length of style with a smaller subappressed acute lateral spine.

Habitat: South Carolina, North Carolina.

Holotype: ♂, River Falls, near Greenville, South Carolina, altitude 3000 feet, July 1, 1931 (*Henry K. Townes, Jr.*). *Allotopotype:* ♀, with the type. *Paratypes,* several of both sexes, in collections of Alexander, Rogers and Townes, with following data: Greenville Co., ravine on north end of Paris Mt., Greenville Co., alt. 1600 ft., April 29, 1932 (Townes, No. 17). Ravine on northeast side Paris Mt., altitude 1400 ft., May 6, 1932 (Townes, No. 20). Between Boy Scout Camp at Calahan Mt. and Saluda Falls, altitude 1200–1700 ft., June 2, 1932 (Townes, No. 26). Big Pisgah Mt., Haywood Co., North Carolina, stream by side of road, altitude 4000 ft., July 19, 1932 (Townes, No. 3).

The present fly is amply distinct from all known members of the subgenus *Elaeophila* in the setiferous outer cells of wing and in the structure of the outer dististyle of the male hypopygium.

Limnophila (Idioptera) mcclureana n. sp.

Mesonotal praescutum and scutum dark, the posterior sclerites of mesonotum paler; pleura with a darker transverse girdle of mesepisternum; wings with a restricted dark pattern, the areas broadly pale in centers, margined with darker; no extensive darkening at arculus; band at origin of *Rs* narrow and interrupted; abdomen yellow, the subterminal two segments blackened.

Male.—Length 11–12 mm.; wing 8–8.5 mm.; antenna 4.8–5 mm.

Described from alcoholic specimens.

Rostrum and palpi black. Antennae black throughout, in male less than one-half the length of body; flagellar segments subcylindrical, the longest verticils less than one-half the segments. Head dark.

Mesonotal praescutum and scutum dark, probably pruinose in fresh specimens; posterior sclerites of notum paler. Pleura pale, the propleura and mesepisternum darker, especially the latter, where a dark transverse girdle is produced; posterior sclerites of pleura pale. Halteres pale, the knobs weakly darkened. Legs with the fore and middle coxae yellow; femora yellow, the tips broadly blackened; tibiae yellow, the tips more narrowly blackened; tarsi black. Wings with the ground-color pale yellow; a restricted darker pattern, including a narrow broken fascia at level of origin of *Rs,* including separate areas at origin of *Rs,* supernumerary crossvein in cell *M* and tip of vein *2nd A*; a second narrow band at cord; fasciae broadly pale buffy in centers, narrowly margined with dusky; outer end of cell *1st* M_2 and marginal spots on veins M_4 and *1st A*; a tiny dark spot at arculus; stigma solidly darker brown; wing-tip narrowly and solidly darkened; cells *C* and Sc_1, especially the former, uniformly brownish yellow to pale brown; veins yellowish brown. Venation: *Rs* square and spurred at origin; *m–cu* at near midlength of cell *1st* M_2.

Abdomen elongate, yellow, the subterminal two segments blackened; pleural membrane narrowly darkened. Male hypopygium with the outer dististyle more acutely pointed than in *fasciata* but less so than in *fasciolata.*

Habitat: Manitoba.

Holotype: Alcoholic ♂, Fort Churchill, July 20, 1936 (*McClure*); Coll. No. 4 Ch 68. *Paratopotypes,* 3 alcoholic ♂♂, July 13–20, 1936; Coll. Nos. 4 Ch 54, 68.

Limnophila (*Idioptera*) *mcclureana* is named in honor of the collector, Mr. H. Elliott McClure, of the Iowa State College. The fly is more closely related to the European *L.* (*I.*) *fasciata* (Linnaeus) than to the Nearctic *L.* (*I.*) *fasciolata* Osten Sacken but is amply distinct from both in the wing-pattern and coloration of the abdomen.

Erioptera (Psiloconopa) lacustris n. sp.

General coloration dark gray; palpi, antennae and legs black; halteres dusky; wings with a strong blackish tinge; veins almost without macrotrichia; veins R_3 ind R_4 upcurved at margin; male hypopygium with a single simple dististyle, its margin with peg-like spines; interbase slender, needle-like.

Male.—Length about 3.5–3.8 mm.; wing 4–4.5 mm.

Rostrum gray; palpi black. Antennae short, black throughout. Head gray; anterior vertex broad.

Mesonotum dark gray, the central portion of praescutum a little darker but without distinct stripes. Pleura dark gray. Halteres dusky. Legs black throughout. Wings with a strong blackish tinge, the stigmal region darker but not clearly delimited; veins darker brown. Macrotrichia almost lacking on veins, even the costal series limited in number. Venation: *Sc* relatively short, Sc_1 ending about opposite the fork of Rs; R_{2+3} subperpendicular, shorter than R_2; veins R_3 and R_4 rather strongly upcurved at margin; R_{2+3+4} about twice R_2 alone; outer medial veins deflected rather strongly caudad; cell M_3 subequal in length to its petiole; *m–cu* shortly beyond fork of *M*; vein *2nd A* straight.

Abdomen black, sparsely gray pruinose; hypopygium large, black. Male hypopygium with a single dististyle, this simple, broad at base, narrowed outwardly, the apex and lower margin with a single row of peg-like spines. Mesal face of basistyle with abundant erect coarse setae; apex of mesal face produced into a slender finger-like lobe. Interbase a slender needle-like spine. Aedeagus long, slender, straight.

Habitat: Michigan (Northern Peninsula).

Holotype: ♂, Raco, on shores of Lake Superior, May 9, 1935 (*J. R. Gross*); in U. S. N. M. Collection. Paratopotypes, numerous ♂♂.

Erioptera (*Psiloconopa*) *lacustris* was included in material kindly submitted to me for examination by Dr. Alan Stone, of the United States National Museum. The species is quite distinct from all other generally similar forms in the venation, unusually reduced trichiation of the wing-veins and the single simple dististyle of the male hypopygium. The most similar species are *E.* (*P.*) *laticeps* (Alexander) and *E.* (*P.*) *pilipennis* (Alexander), both of the Pacific Coast states.

Erioptera (Psiloconopa) churchillensis n. sp.

General coloration yellow, variegated with brown; head dark, the front and orbits pale; praescutum with three brown stripes, the median one more deeply colored in front; pleura narrowly lined with brown; R_{2+3+4} short, about one-half longer than the basal section of R_5; cell *1st* M_2 open.

Female.—Length about 8 mm.; wing 5 mm.

Described from an alcoholic specimen.

Rostrum and palpi black. Antennae 15-segmented, black throughout; flagellar segments oval, the outer ones not abruptly smaller, as in *Trimicra.* Head dark brown, the front and broad orbital region light gray, the latter decreasing in width behind.

Pronotum yellow, narrowly dark brown medially. Mesonotal praescutum yellow, with three brown stripes, the median one slightly darker and wider on anterior half, paler behind;

lateral stripes paler brown; scutum yellow, each lobe with two conspicuous, confluent, dark brown areas; scutellum yellow, with a capillary brown median vitta that extends forward onto the median area of scutum; mediotergite dark brown, the antero-lateral portions broadly yellow. Pleura yellow, narrowly lined longitudinally with brown, including a very restricted line on the ventral anepisternum and a more extensive ventral stripe, involving the prosternum, ventral sternopleurite and meron. Halteres pale, the knobs dusky. Legs with the coxae and trochanters yellow; femora brownish yellow, the tips passing into brown; tibiae similar, the tips more narrowly darkened; tarsi black; legs with relatively short setae only. Wings with a yellowish tinge; veins brown, R_2 and *m–cu* more conspicuously and narrowly seamed with brown; a pale brown seam below tip of R_{1+2}, demarking the outer end of the yellow stigmal area. Venation: Sc_1 ending just before level of R_2, Sc_2 at near midlength of the distance between origin of *Rs* and tip of Sc_1; R_{2+3+4} short, about one-half longer than the basal section of R_5; cell *1st* M_2 open, the distal section of vein M_3 lying free in the membrane in the unique type, probably connecting with M_{1+2} in normal specimens; *m–cu* oblique; cell *2nd A* wide, the distal third of the vein sinuous, quite as in *angularis*.

Abdomen chiefly brown, the incisures paler.

Habitat: Manitoba.

Holotype: Alcoholic ♀, Fort Churchill, July 10, 1936 (*McClure*); Coll. No. 12 Ch 45.

The nearest ally of the present fly seems undoubtedly to be *Erioptera* (*Psiloconopa*) *angularis* (Alexander) of Utah, which has the venation of the radial field of the wing quite distinct. I am now considering these two species to belong to *Psiloconopa* Zetterstedt rather than to *Trimicra* Osten Sacken. It should be noted that very recently Dr. Fred W. Edwards has placed *Trimicra* as a subgenus of *Erioptera*.

STUDIES ON THE PLECOPTERA OF NORTH AMERICA, I.*

By John F. Hanson, Amherst, Massachusetts.

The following new species is described from material collected by Dr. C. P. Alexander in the Adirondack Mountains of New York. I feel it a special privilege to describe this unusual insect since Dr. Alexander is himself very much better qualified to describe it than I. I therefore wish here to acknowledge thanks for his kindness and encouragement and take great pleasure in naming this insect after him, *Taeniopteryx* (*Oemopteryx*) *alex* n. sp.

This is the only member of *Oemopteryx* (which I consider to be a subgenus of *Taeniopteryx*) known from North America. Two other species have been described, the subgenotype, *T. loewii* Albarda of Europe, and *T.* (*O.*) *karakorum* (Šámal) from the Karakorum Mountains in Northern Kashmir, Central Asia.

Taeniopteryx (Oemopteryx) alex n. sp.

Male: General color dark brown or black. Length to apex of wings, 17 mm.; to apex of body, 12 mm. Wings reduced; front wings extending not even to posterior margin of metanotum. Hind wings with reduced venation and no anal fan. Supra-anal process composed of a tube, a bilobed, and a trilobed process. Subgenital plate large, without ventral lobe. Basal segment of cercus bearing a lobe dorsally.

Head slightly darker in color than remainder of body; a lighter colored, raised, glabrous, and somewhat triangular area in front of the hind ocellus and approximating the compound eye. Posterior ocelli about three times as far apart as from compound eyes. Coronal suture and epicranial arms distinctly visible. Antennae 55-segmented.

Thoracic segments uniformly brown. Pronotum as wide as head, with a distinct median black line. Tibiae slightly lighter in color than femora. Fore wings very greatly reduced (length 3.5 mm.), extending not quite to the posterior margin of the metanotum; venation much reduced. Hind wings also greatly reduced in size (length 12 mm.) and venation, but extending considerably beyond tip of abdomen; anal fan obliterated.

Abdomen uniformly brown. Supra-anal process composed of three parts curving upward from a basal bulb. Median sec-

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* Contribution from the Department of Entomology, Massachusetts State College, Amherst, Massachusetts.

tion transverse, terminally bilobed, bearing the posterior section which consists of a tube covered with short spines and having a sharp needle-like process projecting from it. Anterior part also transverse but trilobed terminally. Subgenital plate remarkably produced and extending even beyond the cerci. It is evenly rounded at the tip and curves up and over laterally and caudally; no ventral appendage. Subanal lobes composed of symmetrical sclerotized upper parts and asymmetrical membranous lower parts bearing various sclerotized projections. The darkly sclerotized part which curves up mesad of the cercus is truncate at the tip and rounded basally. The unsclerotized asymmetrical parts extend downward from the rounded basal portions of the subanal lobes and lie in the cup formed by the subgenital plate. The lower part of the right lobe bears a black comb, a black tooth, and a finger-like projection. The corresponding part of the left lobe bears no such heavily sclerotized projections but bears a row of hairs, a finger-like projection, and a blunt tooth. Cerci 5-segmented; first segment constricted near base and bearing a club-shaped membranous lobe dorsally.

Female: Head and thorax dark brown or black; abdomen light brown. Length to apex of wings, 26 mm.; to apex of body, 18 mm. Basal portion of Cu of fore wing white. Subgenital plate triangularly produced to beyond subanal lobes. Eighth sternite slightly cleft.

Head dark brown or black. The raised area in front of ocellus black. Other head features as described for male.

Thorax dark brown or black, as dark as head. Prothorax slightly wider than head, widening basally. Median dark line of prothorax hardly visible. Legs uniformly medium brown. Wings normal in size and venation. Cu of both fore and hind wings white in color from cubito-anal crossvein back nearly to base; cubito-anal crossvein entirely white in fore wing.

Abdomen light brown. Abdominal sternites sclerotized only in a transverse strip in the middle of each segment, except apical three which are completely sclerotized. Subgenital plate wide and triangularly produced to beyond tips of subanal lobes, slightly upcurved at apex. Eighth sternite cleft, with a tiny emarginate flap protruding part way over the genital opening which is near the apical margin of the eighth sternite. Cerci composed of eight segments; the basal segments greatly fused.

Holotype, male; allotype, female (deposited in the Massachusetts State College Collection); paratypes 40 ♂, 12 ♀, Wells, Hamilton

County, New York, along the Sacandaga River, altitude 1000 feet, April 3, 1937 (Coll. Dr. C. P. Alexander). "Collected on snow drifts along river between village and State Public Camp site two miles south."

Although this new species does not agree with Klapálek's generic character of a 4-branched radial sector in the fore wing of the female it must be placed near his genotype, *Oemopteryx loewii* Albarda, on account of many other similarities. The following key shows the close relation between *T.* (*O.*) *alex* and *T.* (*O.*) *loewii* and also the differences which easily distinguish the two species.

KEY

A. Male brachypterous, venation much reduced, anal fan obliterated. Fore wing less than half as long as hind wing, with no narrow prolongation at apex. Costal area without crossveins, radial sector of hind wing usually 3-branched, media usually simple, cubitus usually 2-branched. Supra-anal process composed of three regions, one of which is tubular. Subgenital plate large, without ventral lobe. Subanal lobes asymmetrical. Cercus with basal membranous lobe.

Female not brachypterous. Fore wing without costal crossveins, Rs 2- or 3-branched, second anal vein 2-branched. Subgenital plate produced beyond apex of abdomen in a broad triangle. .... **alex**

AA. Male brachypterous, venation much reduced, anal fan obliterated. Fore wing less than half as long as hind wing, with a narrow prolongation at apex nearly as long as remainder of wing. Costal area of hind wing without crossveins, radial sector 3-branched, media 2-branched, cubitus 2-branched. Supra-anal process composed of two regions one of which is a tubular extension. Subgenital plate large, without ventral lobe. Cercus with a basal membranous lobe.

Female not brachypterous. Fore wing with one costal crossvein near tip of R_1, Rs 4-branched, second anal vein simple. Subgenital plate produced in a broad triangle but not extending beyond apex of abdomen. .... *loewii*

Exuviae of female naïad: General color uniformly medium brown. Length of body 16 mm. Subgenital plate produced in a broad triangle to beyond tip of abdomen. Antennae and cerci extremely long, longer than body.

Head uniformly light brown. Antennae 93–95 segmented; 18 mm. long.

Thorax uniformly light brown. Gills absent. Tips of last tarsal segments dark brown. Femora slightly darker near distal end.

Abdominal tergites slightly darker in color than head and thorax. Only sternites 8, 9, and 10 sclerotized. Subgenital plate produced in a large triangle to beyond tip of abdomen. Cerci 65-segmented; 19 mm. long.

The naïad, described from the exuviae of three females, closely resembles that of *T. californica* but its subgenital plate is more pointed. Its body is much longer and its antennae and cerci are more than twice as long as those of *T. californica* Needham and Claassen.

The fact that both antennae and cerci are longer than the body is a character which makes possible at a glance differentiation from all other known naïads of *Taeniopteryx*.

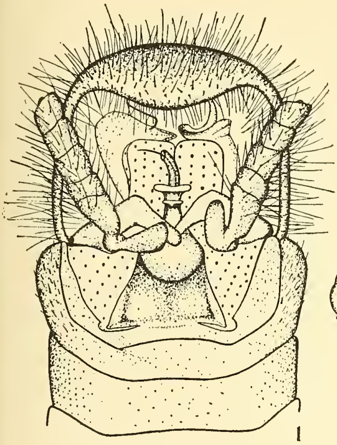
On the basis of the similarity, especially of the females, of the species of *Oemopteryx* Klapálek to species of *Taeniopteryx* Pictet, I think that *Oemopteryx* can not be considered as a distinct genus as has previously been done by Klapálek and Šámal. There are, however, the following characters which, in my opinion, have a subgeneric value:

> Male brachypterous, anal fan obliterated. Fore wing less than half as long as hind wing. Radial sector of hind wing usually three branched. Subgenital plate greatly produced, evenly rounded at apex, and without ventral lobe. Subanal lobes asymmetrical. Cercus with a basal membranous lobe.
>
> Female subgenital plate greatly produced in a broad triangle.

The value of these characters will be better known following a comparison of *T.* (*O.*) *karakorum* which at present is inaccessible to me.

Explanation of Plate II.

Fig. 1. ♂ dorsal view.
Fig. 2. ♂ supra-anal process.
Fig. 3. ♂ subgenital plate.
Fig. 4. ♂ lateral view.
Fig. 5. ♂ wings.
Fig. 6. ♀ wings.
Fig. 7. ♀ ventral view.
Fig. 8. ♀ naïad, ventral view.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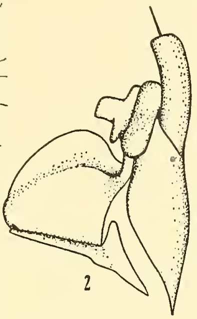
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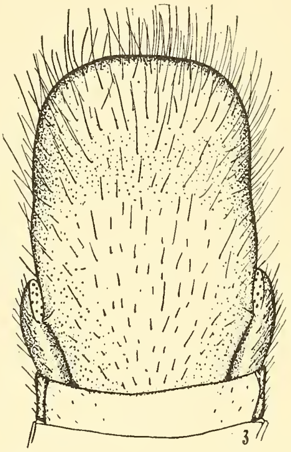
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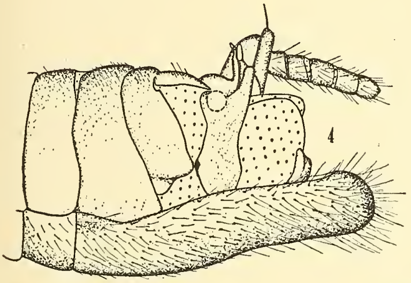
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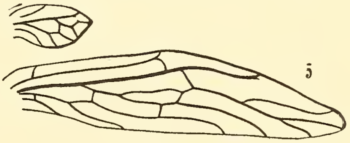
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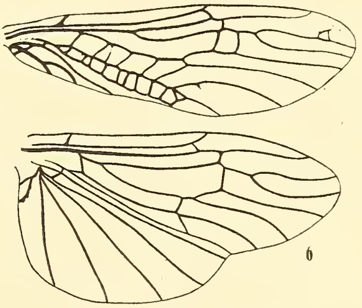
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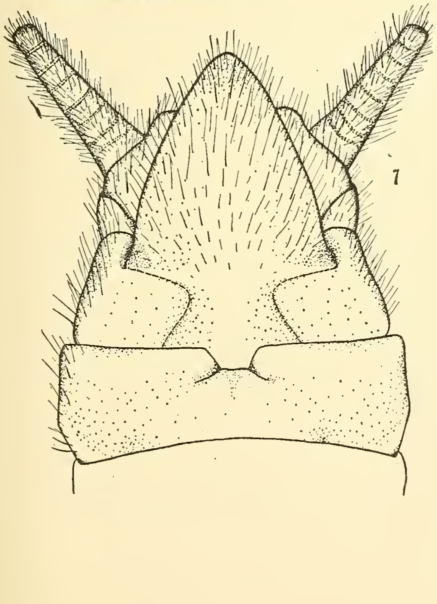
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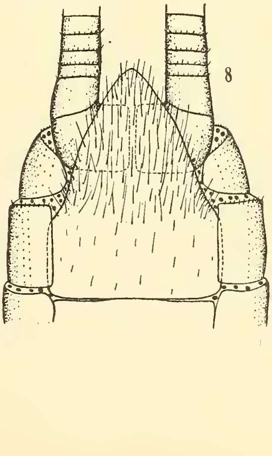
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A SYNOPSIS OF THE NEW WORLD SPECIES OF VERMILEO (DIPTERA-RHAGIONIDAE).

By L. L. Pechuman, Ithaca, New York

It is not the writer's intention to present a complete revision of the New World species of *Vermileo* at this time. However, a certain amount of interesting information and material has been made available, and the writer feels that a summary of our present knowledge of this genus may be of value to future workers.

The genus *Vermileo* was established by Macquart in 1834 to include a single European species *V. degeerii* Macq. This species is the same as Linnaeus' *Musca vermileo*. The correct name of the genotype is then *Vermileo vermileo* (L.). *Vermileo* may be briefly characterized as small flies with an elongate abdomen with the intersegmental membranes well developed so that the segments are distinctly separated; third segment of the antennae somewhat acuminate and bearing a slender, indistinctly three-segmented arista which is as long or slightly longer than the rest of the antenna; legs slender, the posterior pair about twice as long as the other two pairs; tibial spurs 1:2:2; wings long and narrow, almost petiolate at base, anal cell narrow, no posterior lobe present, the fourth posterior and anal cells narrowed or closed at the border, anal vein somewhat sinuous near the base.

Most of the New World species now placed in *Vermileo* have led a rather checkered existence in the field of nomenclature. Walker (1851, p. 155) erected the genus *Pheneus* in which he placed the single species *tibialis* from Jamaica. Walker placed *Pheneus tibialis* with the Asilids next to the genus *Leptogaster* to which it had a superficial resemblance. All later workers have considered *Pheneus* a Rhagionid. Walker's species was known only from the type until Wheeler (1934, p. 236) secured a somewhat damaged specimen from Jamaica.

Williston (1895, p. 108) described the second species from Xucumanatlan, Mexico, placing it in a new genus *Arthrostylum* and calling his species *A. fascipennis*. Williston later (1900, p. 264) decided his species was the same as Walker's *Pheneus tibialis;* Wheeler (1931, p. 168) using Williston's description as a basis decided that *fascipennis* was distinct from *tibialis*.

Coquillett (1904, p. 21) described a *Pheneus opacus* from Ormsby County, Nevada. Wheeler (1918, p. 83), not recognizing Coquillett's species as a *Vermileo,* described as new *Vermileo comstocki* from Alta Meadow, California. Leonard (1930, p. 73) showed that *Pheneus opacus* was a true *Vermileo,* but regarded it as distinct from *V. comstocki.* Wheeler (1930, p. 176), however, was inclined to the belief that his species was a variety or possibly a synonym of *opacus,* but said that more specimens of *opacus* would be necessary to determine this. Since in addition to the type male of *opacus* from Nevada, only two other specimens were known, both males from New Mexico, Wheeler's position was understandable. The writer, however, has secured one female and nine males of *opacus* from two localities. Part of this material has been compared with the type of *Pheneus opacus* and pronounced the same. After comparison with specimens of *V. comstocki,* including topotypic material, the writer has found characters which in his opinion show the distinctness of *opacus* and *comstocki.* The differentiating characters of the two species are included in the descriptive key.

Finally Wheeler (1931, p. 167) described *Vermileo tibialis* (Walker) var. *dowi* from Cuba. However, on the receipt of the specimen of *V. tibialis* from Jamaica mentioned above, Wheeler decided that *dowi* was probably subspecifically distinct. The writer is inclined to regard them as distinct species.

The nomenclatorial tangle was further complicated by a statement of Wheeler's in his description of *dowi* (1931, p. 168) that the hind tibiae had but one spur. This character along with the closed fourth posterior cell would be, in the writer's opinion, sufficient reason to regard the genus *Pheneus* as distinct from *Vermileo.* Walker does not mention the presence of tibial spurs in his description of *tibialis* and his figure shows two spurs on all the tibiae. Walker's figure was undoubtedly inaccurate, but it was also difficult to reconcile Wheeler's and Williston's descriptions as Williston had mentioned two spurs on the hind tibiae in *fascipennis.* However, an examination of specimens of *dowi* from Wheeler's original series shows the presence of two spurs on the hind tibiae instead of one; Mr. Oldroyd informs me that the tibial spur formula of the type of *fascipennis* corresponds with Williston's description. No specimens of *tibialis* still in possession of their hind legs are known, but doubtless two tibial spurs are present. Since the variable character of a closed fourth posterior cell is insufficient for the retention of the genus *Pheneus,* it must, on present evidence at least, be considered a synonym of the older name *Vermileo,* and the tibial spur formula may be written as 1 : 2 : 2 with a fair degree of assurance.

We have then in the New World five described species of *Vermileo* which are chronologically arranged below.

1851. *Vermileo tibialis* (Walker). [*Pheneus tibialis* Walk.] Type male from Jamaica; a female from Jamaica determined by Brunetti in the British Museum; a male from Jacksontown, Jamaica, determined by Wheeler in the Museum of Comparative Zoology at Harvard. Type in British Museum.

1895. *Vermileo fascipennis* (Williston). [*Arthrostylum fascipennis* Will.] Type male from Xucumanatlan, Guerrero, Mexico; one male and one female from Omilteme, Guerrero, Mexico, in British Museum. Type in British Museum.

1904. *Vermileo opacus* (Coquillett). [*Pheneus opacus* Coqu.] Type male from Ormsby Co., Nevada; known also from New Mexico, Utah, and California. Type in U. S. National Museum.

1918. *Vermileo comstocki* Wheeler. Type male from Alta Meadow, near Sequoia Giant Forest, California; known from both sexes. Type supposed to be in the Museum of Comparative Zoology at Harvard.

1931. *Vermileo dowi* Wheeler. [*Vermileo tibialis* (Walk.) var. *dowi* Wheeler.] Type not designated in description; described from a male and female from Trinidad Mts., Cuba; known from Mayari and San José, Trinidad Mts., and Soledad, Cuba. Type specimens in Museum of Comparative Zoology at Harvard.

The extremely interesting larval habits of *Vermileo comstocki* are described in detail by Wheeler (1930, Chap. 5); he also gives notes on the habits of *dowi* (1930, p. 275; 1931, p. 166). The habits of the remaining three species are unknown, but doubtless resemble those of *comstocki* and *dowi*. Larvae of *Vermileo* were collected by Dr. Donald DeLeon at Zion Canyon National Park, Utah; three adult males of *V. opacus* were reared from this material by Dr. O. A. Johannsen. Further information on the larval habits of *V. opacus* is not available at present.*

DESCRIPTIVE KEY TO THE NEW WORLD SPECIES OF VERMILEO.

1. Wings without dark markings; fourth posterior cell usually open although sometimes much narrowed at margin . . 2

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* Dr. DeLeon informs me that he is publishing on the distribution and larval habits of *Vermileo* in southwestern United States and describing a new species from Mexico.

Wings with dark markings; fourth posterior cell usually closed. 3

2. Ground color of mesonotum and scutellum dull grayish brown; the three thoracic stripes are a dull brown, the middle one split by a grayish band which is usually as wide as either half of the stripe; wings with a brownish tinge. (Calif.). ant. x vein at [illegible] of discal [illegible] .... *comstocki* Wheeler. notes by W³.

Ground color of mesonotum and scutellum yellowish brown becoming very pale in region of humeri; the three thoracic stripes are a shining brown, the middle one split by a fine yellowish line which sometimes may be almost invisible; wings practically hyaline (Calif., Nevada, Utah, New Mex.) ant. x vein 1/3 to 1/2* of discal [illegible] *type ♂ ..... *opacus* (Coqu.)

3. Face bare; apical spot becomes somewhat paler at extreme tip of wing (Mexico) .... *fascipennis* (Will.)

Face densely white pollinose; apical spot of uniform density. 4

4. First antennal segment about one and one half times as long as broad; posterior half of abdominal tergites not infuscated but first tergite bearing anterio-dorsally a black transverse band; cross-band of wing narrow and somewhat irregular (Jamaica) .... *tibialis* (Walk.)

First antennal segment more than one and one half times as long as broad; posterior half of abdominal tergites brownish; first tergite without a transverse band; cross-band of wing broader and with relatively straight margins (Cuba) .... *dowi* Wheeler.

Vermileo opacus (Coqu.).

This species has been known only from the type male collected in Ormsby Co., Nevada, and two males from Alamogordo, New Mexico. The writer has had the opportunity of examining three males from Zion Canyon National Park, Utah (D. DeLeon) and six males and one female from Arroyo Seco, Pasadena, California (F. E. Lutz). Leonard (1930, p. 72) gives an excellent redescription of the type male and there is no object in repeating it at this time. The female, however, has not been previously described.

Female.—Length 5.5 mm. *Head:* Face and front light brown pollinose; sides of face parallel; sides of front divergent so that front is twice as wide at vertex as at antennae; width of front at antennae very slightly wider than in male; occiput brownish pollinose with scattered golden hairs; palpi and proboscis pale brownish yellow; first two segments of antennae yellow, third segment and arista brown; first segment half again as long as second, third slightly longer than second; arista slightly longer than remainder of antennae.

Thorax: Mesonotum dull yellowish brown pollinose, paler in region of humeri and with three somewhat shining brown stripes, the two lateral ones ending before the humeri; the median stripe divided by a faint narrow line; the scutellum light brown; the pleura brown with a white pollinose stripe above the coxae; halteres dark brown shading to yellowish near the base of the stalk; metanotum brown, sparingly white pollinose. Legs: coxae pale yellow, front pair with long white hairs near the apex; trochanters yellow; front and middle femora brownish yellow; hind femora darker yellow shading to brown at apex, about twice as long as middle and hind pairs and somewhat clavate; tibiae and tarsi matching in color their respective femora, apical tarsal segments being somewhat darker. Wings: membrane faintly but uniformly tinged with pale brownish; fourth posterior cell very much narrowed at margin; anal cell open.

Abdomen: Elongate, but less slender than in male; shining dark brown with yellow margins at base of all segments except the sixth; yellow margin of first segment broad, others narrower than in male.

Arroyo Seco, Pasadena, California, June 19, 1931, F. E. Lutz. Associated with males of same species collected on same date.

The writer wishes to acknowledge the kind assistance of Dr. C. H. Curran from whom specimens of *V. opacus* were obtained, Mr. C. T. Greene who compared specimens of *V. opacus* with the type, Mr. G. B. Fairchild from whom specimens of several species of *Vermileo* were secured, and Mr. H. Oldroyd who sent notes on specimens in the British Museum including the Walker and Williston types.

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COURTSHIP AND COPULATION IN BROCHYMENA SULCATA VAN D.

By Herbert Ruckes, New York, N. Y.

During the summer of 1937 the pentatomid, *Brochymena sulcata* Van D. appeared in great abundance in the vicinity of Las Cruces New Mexico. The insect was found on the trunks of apples, honey locust (*Gleditsia triacanthos* L.) and red mulberry (*Morus rubra* L.). Hundreds of individuals were observed on the last two hosts, trees that line the roadway through the grounds of the State College at Mesilla Park. The latter part of August appears to be the mating season for this species, for on the 28th of that month the following notes were made concerning the courtship and copulation.

Mating apparently goes on during the morning and afternoon; no pairs in copulation were observed during the late evening nor could any be found, with the aid of a spot light, after dark. Prior to the actual copulation the males showed a peculiar behavior toward the females. Females remain relatively passive during this time while the males run hurriedly up and down the tree trunks; while so doing they invariably keep up a noticeable beating of their antennae, moving them rhythmically in various directions. Frequently, as a male comes in contact with a female's body he strokes it with his antennae, seemingly to determine whether or not she is prepared to consummate the mating.

The male mounts on the female's back in the orthodox manner; then a most remarkable act occurs. The genital cup of the male is so constructed that the claspers and penis open from the upper surface of the segment. The male finds it necessary to rotate this cup on its longitudinal axis through 180 degrees, so that the penis and claspers will be exposed ventrally and thus may be directly everted to enter the valves of the female body. I actually saw this act take place in a number of cases; whether or not it occurs in all pairs I cannot say but it seems likely that it does, the male genital cup being constructed as it is. I have an idea that such behavior is common in other pentatomids as well for it is not at all uncommon to find pinned specimens, in collections, in which the male genital segment is inverted, the specimens possibly have been taken during or just after copulation.

During the process by which the male completes the insertion, the female rests quietly but opens, slightly, the pairs of wings and when so doing automatically opens the valves of her genital segment. When the physical contact is completed the male then proceeds to dismount and remains in copulation attached to the female endwise as is typical of so many other heteroptera.

During the last stages of the mating, the male, facing in the opposite direction to that of the female begins vibrating his hind legs; in doing this he causes his tarsi and tibiae to brush the lateral edges of the female's abdomen, possibly transmitting to her some erotic stimulus. The rhythm of the beating seems to be timed; without the use of an accurate device no exact count could be made but the vertical movements of the legs appear to occur about two or three times per second.

How long the pairs remain in copulation I did not determine; certainly most of them keep up the physical contact for two hours, for it was that length of time I spent in making most of these observations. When disturbed some pairs would separate but most moved off to a nearby locality and the males would, after a brief interval, start the rhythmic beating of their hind legs all over again.

NOTES ON THE LARVAE OF HELIOTHINAE.

By Alex K. Wyatt, Chicago, Ill.

A renewed interest in *Schinia* and allied genera has resulted in the discovery of the early stages, heretofore unknown, of several species and additional data on others found in the Chicago area.

Heliothis phloxiphaga G. & R.

This has been reared several times by Mr. Emil Beer and others besides myself from larvae feeding on blossoms and seeds of Columbine, *Delphinium* and New England Aster. Single larvae were also reported found on bindweed (*Convolvulus*) and on the small ragweed (*Ambrosia elatior* L.). There are apparently two broods in this area, larvae having been found in early June and in September and October; the moths in May and again in July and August. Hibernation occurs in the pupal stage.

Dasyspoudaea lucens Morr.

Capture of this moth by Mr. Maurice Bristol on July 3, 1935 was the first report of local occurrence, the two specimens taken being found resting on the opening flowers of lead plant (*Amorpha canescens*). A determination to find the larva resulted in a trip to Elgin on August 9, 1936, with Messrs. Bristol and Arthur Herz. The first quarter hour examination of lead plant proved fruitless, but after the first beautifully checkered larva was found, it became an easy matter to locate more of them on the densely flowered terminal spikes. The protective resemblance is pronounced, yet they drop quickly when disturbed. They fed through quite rapidly and pupated by August 17. Considerable parasitism was noted. Mr. Beer to whom I gave some pupae, and I, succeeded in obtaining twelve moths from about twenty pupae and some of those remaining appear to be alive and we hope will develop next year. The moths all emerged within a very few days, July 8 to 13. Messrs. Bristol and Herz were unsuccessful in carrying the pupae through the long period of almost eleven months.

Rhodophora gaurae A. & S.

This is not rare with us and flies for an extended period, July 18 to September 8 being recorded. Both moths and larvae are found on *Gaura biennis*. An occasional specimen will emerge in September from pupae of the same year, but once hibernated, they do not emerge until the following July.

Rhodophora florida Gn.

This is usually reported as feeding on evening primrose (*Oenothera*), but we find it more commonly on *Gaura biennis* with *R. gaurae* and the same data and remarks apply.

Lygranthoecia thoreaui G. & R.

Larvae of this species were found by Arthur Herz feeding at first on the male bloom of the great ragweed (*Ambrosia trifida*) and later on the seed vessels in the axils below. The young larva is green with black spots dorsally, the more mature larva a brownish grey, unspotted, and with a large head. Mr. Herz tried for several years to carry pupae through to emergence, but was unsuccessful. I too, failed on my first attempt, but this year several specimens emerged, one of them from a 1935 larva. This proved the identity which we had suspected. The moths are apparently quite sluggish for comparatively few have been taken. Young larvae have been beaten from the flowering heads from several localities and the species is probably not nearly as rare here as it has been considered heretofore. Mr. Herz tells me that the larger larvae hide during daytime in the dead leaves on the lower part of the plant stalk.

Lygranthoecia marginata Haw.

The larva of this species feeds on the small ragweed (*Ambrosia elatior*) and can be found over a long period, as late as October 14, 1934, being reported by Herz.

Schinia trifascia Hbn.

On September 2, 1915, Mr. Beer and I found quite a number of moths on bloom of *Eupatorium serotinum.* In 1934, when my interest in this group had been revived, I sought and found the larvae, both on *Eupatorium sessilifolium* and *E. perfoliatum.* These pupated September 20 to October 2. Parasitism was severe and only two pupae resulted, from which I secured one moth on August 6, 1935.

Schinia arcigera Gn.

This species feeds on *Aster puniceus* and *Aster laevis* according to Mr. Henry Bird, who described the larvae (Ent. News, XXXIV, pp. 193–199, 1923). Mr. Herz and I found a few larvae September 30, 1934, on a common white aster, probably *A. multiflorus.* One pupa was secured from which the moth emerged September 16, 1935.

Rhodoecia aurantiago Gn.

This species is now classed with the Heliothinae. In 1930 when collecting with Mr. Herz at Tremont, Indiana, we discovered a clump of *Gerardia grandiflora.* Because of his experience in Germany, he recognized it as a likely food plant for blossom feeding larvae and sought for and found one small larva, which grew to maturity, but was lost in some way. Another larva in 1932 also disappeared. On August 27, 1933, on a trip to Waukegan, Illinois, Herz, Beer, A. L. McElhose and the writer found *Gerardia* plentiful and it was not long before we found larvae. The bright yellow blossom of *Gerardia grandiflora* fills out to a considerable size before it opens. We found that the young larva apparently entered the head end of the blossom by a small round hole and then seemingly sealed the opening with a parchment-like material that may have been silk, but was impossible to identify in the field. The larva, safely housed within, fed on the ovary and stamens, finally eating its way out through the corolla and seeking another blossom. Larger larvae which are almost black in color, were found hiding under leaves or other cover at the base of the plants. These larger larvae left unmistakable signs of their presence in the badly mutilated blossoms or the empty, partly blackened seed vessels. *Gerardia pedicularia,* a species with much smaller bloom, was also affected quite as freely as the larger species. At home, when the original food plant was not available, the larvae were given garden snapdragon and butter-and-eggs (*Linaria*). These proved acceptable substitutes. Pupation took place September 1 to 14 and the moths emerged July 21 to August 8, 1935. One specimen from these 1934 larvae remained in pupa until July 5, 1936, and three others did not emerge until August 9–10 and 14 of 1937, having lain as pupae through three winters. They were exposed to severe cold each winter, care being taken to avoid sudden changes of temperature.

Pyrrhia umbra Hübn.

This also is now included among the Heliothinae. The larva has been found on *Desmodium,* on choke cherry and on *Pentstemon,* feeding on the blossoms and seed and sometimes on the tender foliage. Numerous records of captures from May 8 to October 30 and records of young larvae found June 20 and August 8, indicate at least two broods. Two very small larvae found June 20, pupated on the same day, July 8, but the moths emerged August 14 and 31 respectively, showing a considerable divergence in pupal period and probably accounting for the extended period of flight.

One other species, as yet unidentified, is definitely on my schedule for 1938 collecting. The single larva found on *Liatris cylindracea* failed to pupate, so I shall have to try again.

For the benefit of collectors who might look for larvae of *L. thoreaui,* it may be well to mention other larvae that are likely to be encountered on *Ambrosia trifida.* Most commonly found will be the green larva of *Ogdoconta cinereola.* Next will be a semi-looper resembling bird droppings. This will develop into *Acontia erastrioides. Drasteria erechtea* and various Geometridae are also to be found, but one larva that is not uncommon in some areas, resembles

L. thoreaui in general appearance and habits. This is *Plagiomimicus pityochromus,* which makes a practice of hiding in the dry leaves on the lower part of the plant stalk. This larva is smaller than *thoreaui,* blackish rather than brown grey and has a black patch dorsally just behind the head.

A few words on the subject of rearing the larvae may not be amiss. Tightly closed boxes or jars to keep the food plant fresh will do while the larvae are small, but my experience has been that these larvae will thrive better if given plenty of air and kept somewhat sheltered or warm during the day. A little sunshine will do no harm. When we were active in rearing Papaipemae, Emil Beer devised a practical scheme, which I find very convenient. It consists of a cylinder of screen wire fitted over the edge of an ordinary flower pot of suitable size, the open end being covered with cloth tied in place or with glass fastened by means of a wire or string through the screen meshes. The whole can be set in a saucer and the earth in the pot watered from below. For *Schinias* and the like, I place a sheet of paper over the earth, leaving holes or a margin for larvae to get below it. Put the food plant in a bottle or jar with water and set on the paper, cover the pot and let them go for two or three days or as long as the food plant remains in good condition. The paper will collect a good deal of the frass and can be discarded when fresh food is supplied. Care must be taken to provide access to the food, for many larvae cannot climb the sides of a flower pot. Old stems leading to the screen or to the new food supply from the soil surface will answer admirably. The bottle or jar must be packed to prevent larvae from crawling into the water and drowning. An occasional spraying of the food plant with water may be helpful.

Pupae are taken from the soil and are kept in a similar flower pot on top of the soil. They should be covered with sphagnum moss with a layer or two of paper over all to keep out some of the dust and should be stored in a cool place; an unheated porch or a garage that does not become foul with gas fumes, will do. For want of a better place a wooden box in the open will serve, but water should be prevented from draining into the flower pot. An occasional handful of snow on top of the moss or moistening with water is helpful, always bearing in mind that the colder the temperature, the less moisture is needed. When the weather warms, more moisture must be supplied and when emerging time approaches, I aim to supply both moisture and heat from a sunny window or warm kitchen, to approximate natural conditions.

A PHILOSOPHER LOOKS AT BIOLOGY.

(Contributed by PHIL RAU, Kirkwood, Mo.)

Biology[1] is at a standstill to-day because it has been dealing with death rather than with life; with specimens preserved in alcohol, with butterflies not on the wing but on the pin, with carcasses left by the gallows for *post-mortem* study, with "preparations" of tissue on microscopic slides. Goethe foresaw it all a hundred years ago, and made his brilliant devil say:

> "He that would study and portray
> A living creature, thinks it fit
> To start with finding out the way
> To drive the spirit out of it.
> This done he holds within his hand
> The pieces to be named and stated,
> But ah! the spirit-tie that spanned
> And knit them, has evaporated.
> This process, chemic science pleases
> To call *Naturae Encheiresis,*
> And in the very doing so, it
> Makes itself a mock, and does not know it."

Perhaps biology will rebel soon against its domination by the methods and concepts of physics; it will discover that the life which it is privileged to study reaches nearer to the basis of reality than the matter of physics and chemistry. And when biology it as last freed from this dead hand of the mechanistic method, it will come out of the laboratory and into the world; it will begin to transform human purposes as physics changed the face of the earth; . . . It will reveal even to philosophers, who for two hundred years have been the slaves of mathematicians and physicists, the directive unity, the creative resourcefulness, and the magnificent spontaneity of life.—WILL DURANT, *The Mansions of Philosophy,* pp. 106–107, 1929.

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[1] The editor takes exception to the term "Biology" as used here. Biology inspires the study of nature—of living things. The study of dead things is covered by the term "Anatomy," Taxonomy or what not.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

BUY OR EXCHANGE: Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, College of the City of New York, New York City.

EXCHANGE OR FOR SALE.—*Catocala herodias* (Gerhardi), *Graptolitha viridipallens* and others. Wanted: Rare N. A. Macro-Lepidoptera. F. Lemmer, Lakehurst, N. J.

WANTED.—North American CHRYSIDIDAE for exchange or determination, with privilege of retaining duplicates. W. G. Bodenstein, Dept. Entomology, Cornell University, Ithaca, New York.

PENTATOMIDAE: Want to buy or exchange Petatomidae from the United States and Mexico. Herbert Ruckes, College of the City of New York, 17 Lexington Ave. N.Y.C.

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BULLETIN

OF THE

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Vol. XXXIII June, 1938 No. 3

THE ARCTOPSYCHIDAE OF CONTINENTAL AMERICA NORTH OF MEXICO (TRICHOPTERA)

By Lorus J. Milne and Margery J. Milne
Randolph-Macon Woman's College, Lynchburg, Va.

We are pleased to present herein descriptions and illustrations of the North American species of Arctopsychidae in the adult condition, and to add to the knowledge of Trichoptera the first arctopsychid larval and pupal diagnoses and figures. The material on imagines is from the senior author's thesis "The Trichoptera of continental America north of Mexico," the text of which is too full for present publication. The larval and pupal discussions are part of the junior author's thesis "Immature North American Trichoptera."

The family rank of Arctopsychidae dates from 1924 when Martynov separated the genera *Arctopsyche* and *Arctopsychodes* from the *Hydropsychidae*. These genera were very distinct from the true hydropsychids in having stout, serrate antennae, a short second segment of the maxillary palpi, rather broad wings of similar form, and peculiar male genitalia. In some ways they resemble philopotamids without ocelli, but many characters show this to be a superficial similarity. The relationship of the Arctopsychidae to the Polycentropodidae is more marked. Certain features of the fore wing venation and of the male genitalia are remarkably similar. However, the lack of a subapical spur on the fore tibia seems to be a reliable character for easily separating these two families.

Arctopsyche was erected in 1868 by M'Lachlan for one Russian species described nine years before by Kolenati. *Arctopsychodes* of Ulmer (1915) is a weak genus separated from *Arctopsyche* on the basis of a minor venational difference in the hind wing. The third genus in the family is *Parapsyche* of Betten (1934), the genitalia of which are quite different from those of the other two genera.

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Arctopsyche contains more than a dozen species, *Arctopsychodes* is monotypic and *Parapsyche* is ditypic. All are large, robust species from the cooler parts of the northern hemisphere. All have hairy eyes, no ocelli, and spur formula 2–4–4. The maxillary palpi are five-segmented, the basal segment short, the second somewhat longer, the next two longer still, the fifth longest of all and distinctly annulated.

The eggs of Arctopsychidae are still unknown. The larvae, here described and illustrated for the first time, are very similar to those of Hydropsychidae but regularly differ in two striking characters. The gills are in bundles on a common stalk, somewhat reminiscent of a partially contracted Hydra. The gula is a rectangular plate completely separating the epicrania and extending from the labium to the occipital foramen. In Hydropsychidae, on the other hand, the gill filaments arise on the sides as well as the apex of the short stalk, and the gula is triangular or crescentic and does not approach the labium, the epicrania being contiguous over most of their ventral margins.

In North America, five species have been recognized, one of them the genotype of Arctopsyche. Both sexes are known in two of these, but the larvae and pupae of only one is as yet definitely associated. Other species of larvae are before us, but their identity is unknown. For the present, we can do no more than indicate their characteristics and differences.

KEY TO THE NORTH AMERICAN ARCTOPSYCHIDAE

1. *Adults*

1. Eighth ♂ sternite with a convex posterior margin, forming a shelf under the genitalia, which project but little beyond it; gonopods erect, distinctly separated from other genitalic parts except over a small area of attachment; ♀ intermediate tibiae not flattened: *Parapsyche* Betten........ 2

Eighth sternite in ♂ not as above, the genitalia projecting far beyond it; gonopods not erect, attached over a wide area; ♀ intermediate tibiae flattened: *Arctopsyche* M'Lachlan.... 3

2[1]. Fore wing discal cell about thrice as long as broad; fore wing not over 10 mm. (♂) or 12 mm. (♀) in length; ♂ tenth tergite furcate; a prominent postero-medial tooth on gonopods, the gonopods concave posteriorly: *Parapsyche apicalis* (Banks)

Fore wing discal cell not more than twice as long as broad; fore wing length over 11 mm. (♂), ♀ still unknown; ♂ tenth tergite not furcate; no tooth on gonopods, which are concave but subcylindrical, curved postero-medially: *Parapsyche elsis* Milne

3¹. Male aedeagus with a prominent, dorsal, subapical, upturned tooth; tines of furcate tenth tergite divergent, rounded apically: *Arctopsyche ladogensis* (Kolenati)

No such median tooth as above; tenth tergite quite different . . 4

4³. Male aedeagus much swollen subapically; submedian process of ♂ tenth tergite furcate, the outer ramus considerably longer; postantennal setiferous warts pear-shaped, the apex directed forward and mediad: *Arctopsyche irrorata* Banks

Male aedeagus not swollen, the sclerotized portion extending much farther ventrally than dorsally; submedian process of ♂ tenth tergite not furcate; postantennal setiferous warts reniform, the emargination in the antero-medial margin: *Arctopsyche grandis* (Banks)

2. *Pupae*

But one species is known from this stage; see under *Arctopsyche grandis* (Bks.)

3. *Larvae*

1. Gills on mesothorax 2

No gills on mesothorax 4

2¹. Metathoracic gill clump double; lateral line gills commence before 4th segment; 7th segment with three separate gill clumps each side below lateral line, only one of which is a member of the lateral series; sclerites lighter colored 3

Metathoracic gill clump single; lateral line gills commence on 4th segment; 7th segment with a single gill clump just below lateral line and a double gill clump farther ventral; sclerites darker colored: Six specimens examined from Jasper National Park, Alta., and Corvallis, Ore.: *Type 2*

3². Lateral line gills commence on 2nd segment with a single clump below line: Seventeen specimens examined from Almont, Colo.: *Arctopsyche grandis* (Bks.)

Lateral line gills commence on 3rd segment: Two specimens examined from Cultus L., B. C.: *Type 1a*

4¹. No lateral line gill clumps on 3rd segment; segments 2 to 5 inclusive with three separate ventral gill clumps remote from lateral line: Seventeen specimens examined from Cultus L., B. C.; Glacier, Wash.; Mt. Hood National Forest, Ore.: *Type 3*

A gill clump below lateral line on 3rd segment; only two gill clumps other than lateral line series on segments 2 and 3, these very close together: One specimen examined from Cultus L., B. C.: *Type 4*

Arctopsyche M'Lachlan

Hydropsychidae: Arctopsyche n. gen. for *Aphelocheira ladogensis* Kolenati (1859), haplotype, 1868 M'L. p. 300. Valid genus, 1878 McLachlan p. 377, 1907 Banks p. 48, 1907 Ulmer p. 177, 1934 Betten p. 180, 1938 Ross p. 14.

Arctopsychidae: Arctopsyche (M'L.) type genus, 1924 Martynov p. 98. Valid genus, 1934 Betten p. 180 footnote, 1936 Milne pp. 65, 66.

Species: A. amurensis Martynov, 1934; *composita* Martynov, 1930; *grandis* (Bks.) 1900 (with synonym *A. phryganoides* Banks, 1918); *irrorata* Banks, 1905; *ladogensis* (Kolenati), 1859, genotype, (with synonyms *A. obesa* McLachlan, 1878, and *ramosa* McLachlan, 1878); *lobata* Martynov, 1930; *maculata* Ulmer, 1907; *palpata* Martynov, 1934; *pluviosa* Navás, 1916; *sinensis* Martynov, 1909; *spinifera* Ulmer, 1907. *Distribution:* Northern hemisphere, especially the cooler parts.

Labial palpi nearly half as long as maxillary pair. Outer protibial spur two-thirds length of inner, twice the length of tibial diameter. Mesotibiae with about 20 short, yellow spines; subapical spurs about at tibial midpoint, the outer three and a half times the length of the tibial diameter, three-quarters as long as its mate, one and four-fifths its own length before apicals, slightly longer than outer apical, which is two-thirds as long as inner; first four tarsal longer segments with a number of short, yellow spines below. Metatibiae with about thirty short, yellow spines; subapical spurs subequal, slightly more than thrice as long as tibial diameter, nearly twice their own length before apicals, slightly longer than outer apical, which is one-eighth shorter than its mate. Evidences of retained larval gills mark the sides of the abdomen of most specimens. Genitalia as illustrated. Female protibial spurs twice length of tibial diameter, the mesotibiae and tarsi considerably flattened.

Arctopsyche grandis (Banks)

Hydropsyche grandis n. sp., 1900 Banks p. 258. *Arctopsyche grandis* (Banks), valid species, 1907 Banks p. 48, 1907 Ulmer p. 178, 1934 Betten p. 180, 1936 Milne p. 66, 1938 Ross p. 14.

Arctopsyche phryganoides n. sp., 1918 Banks p. 21. *Arctopsyche phryganoides* Bks.; valid species, 1934 Betten p. 180; synonym to *H. grandis* Bks., 1936 Milne p. 66.

Types: Holotype ♂, paratype ♂ of *Hydropsyche grandis* Banks, "S. W. Colo., 27–VII–1899" in the Museum of Comparative Zoölogy, "Type 11514." Holotype ♀ of *Arctopsyche phryganoides* Banks, "Banff, Alta., 3–VIII" in the same collection, "Type 10074."

Material examined: 34 adults from Alta. (Banff, Calgary, Waterton Lakes), B. C. (Cranbrook, Kaslo, Kerameos, Lillooet, Merritt, Seton Lake, Vancouver), Cal. (Shasta Springs), Colo. (N. Creede, Summit Co., "S. W. Colo."), Idaho (no given place), N. Mex. (Beatty's Cabin), Ore. (Alsea Mt., Stayton), P. Q. (Abitibi Region in northwestern part), Utah (Provo). Flying in months March (1 specimen), April (1), May (5), June (5), July (14) and August (8). The early specimens were from Oregon. Seventeen of the specimens were males.

Four pupae from Colo. (Almont), all June 21, 1934. One was very large (14.0 mm.) and immature, one smaller and immature (12.0 mm.), one very mature but like the preceding two in lacking a complete case and larval sclerites. The fourth specimen, nearly mature, was in an unbroken case containing the remains of the larval skin. The last two specimens measured 11.9 and 12.0 mm. respectively.

Seventeen larvae from Colo. (Almont), 2 commencing pupation when killed Feb. 21, 15 mm. long; 1 same length June 22, 2 pale 10 mm. larvae July 4; 3 darker 15 mm. larvae Aug. 8; 5 dark 20 mm. larvae Aug. 30; and 4 dark 20 mm. larvae Sept. 7; all 1934. The species apparently overwinters in the larval condition, pupates in early spring, emerges predominantly in June and July. Probably two years are taken for a complete life cycle.

Description

Adult: Head grayish brown, posterior warts somewhat elevated, like vertex in having considerable long, whitish yellow hair; upper portion of face with whitish hair, lower portion with sparse, brownish yellow hair; antennae yellow, basal segment with some long, whitish yellow hair; maxillary palpi brownish yellow, basal segment with some long, stout, yellowish hairs internally; labial palpi yellow, nearly half as long as maxillary pair. Pronotal warts brownish yellow, medially with white to yellow hair, laterally with dark brown; pleura and legs yellow. Mesonotum reddish yellow, with a broad, median furrow, otherwise very convex, the summit of each convexity with considerable very short, whitish hair; scutellum pale reddish yellow; pleura and coxae pale reddish yellow, legs otherwise paler yellow; tegulae dark brown with both white and brownish hair; wings brownish yellow, veins slightly darker, membrane grayish, with mixed brown and gray hair, the latter in patches. Metanotum dark grayish brown, pleura and coxae paler, femora yellow, tibiae yellowish white, tarsi yellow; hind wing grayish brown, the membrane with scanty, short, yellowish hair. Abdomen reddish brown, genitalia concolorous in ♂, yellowish in ♀, of form as illustrated.

Pupa: Face and mouth parts with brown and black scattered hairs; labrum wider than long, with numerous dark brown, long bristles laterally and shorter ones anteriorly; vertex with sparse, long, brown hair. Mesonotum and metanotum with sparse, fine, brown hair; coxae and trochanters of all legs with scattered brown and black hairs. Ventral surface of 8th and 9th abdominal segments with long brownish hair; oblique ridge on sclerotized processes of 9th segment ventrally with four long yellow setae; posterior margins of abdominal tergites 4 to 7 inclusive with sparse fine brown hair; sclerites as illustrated. Antennae extend to 9th abdominal segment or slightly beyond. Gills on abdominal sternites only as follows: a row near the lateral line, formed of single clumps on segments 1, 2 and 7, and double clumps on 3 to 6 inclusive; ventrad from these is another series on segments 1 to 7 inclusive, formed of double clumps; on segment two, there is a single clump between the two series of gills; all gills are at the posterior margin of the segments. Pupal case either loosely constructed of longitudinally placed, plant fibers with a few pebbles and seeds and numerous silk threads dangling here and there, or chiefly of pebbles, bulkier, with only a little plant material, the fibers placed longitudinally however.

Larva: A caseless, thysanuriform type, probably found in rapid water. Body whitish brown, the sclerites brown to yellowish brown, with black markings as illustrated. All three thoracic segments with broad shield shaped sclerites dorsally, the prothoracic member splitting into right and left halves at ecdysis, the meso- and metathoracic members breaking on a transverse line of weakness shown by a series of dots in the illustrations. All sclerites edged in black and covered with numerous hairs and bristles. Pleura of thoracic segments with characteristic plates bearing the coxal groove, and a triangular plate loosely attached to anterior margin of epimeron. Prosternum and last two abdominal sternites with weak sclerites, that of the prosternum of characteristic form. A long tuft of black hairs near base of each proleg. The arrangement of the gill filaments in clumps on a stalk, and the form of the gula, are easy characters for separation of this larva from non-arctopsychid types; the gill formula itself must be relied upon for specific distinctions, since the plates seem to be uniform, and variation in the mandible teeth is negligible. The lateral line has a series of single clumps of gills above the line on segments 3 to 6 inclusive, and a similar series below the line on these and the 2nd and 7th segments also. The more lateral ventral series has a gill clump on mesothorax and 7th abdominal, and double clumps on metathorax and segments 1 to 6. The more ventral series is of single clumps on segments 2 to 7 inclusive.

Metamorphotype: One, illustrated, in the Milne collection.
Illustrations: Plates III and IV.

Arctopsyche irrorata Banks

Arctopsyche irrorata n. sp., 1905 Banks p. 217, pl. 2 fig. 26. *A. irrorata* Banks, valid species, 1905 Banks p. 15, 1907 Banks p. 48, 1907 Ulmer, p. 178, 1908 Bks. p. 156, 1934 Betten p. 180, 1936 Milne p. 66.

Type: Holotype ♂ "Black Mts., N. C., VI, Beutenmuller" in the Amer. Mus. Nat. Hist.

Material examined: 2 ♂♂ adults, the type mentioned above, and one in the Milne collection "Sunburst (Haywood Co.), N. C., late V, 1913."

Description

Adult: Indistinguishable from *A. grandis* except in the postantennal setiferous warts and the genitalia, which are described in the key, and illustrated.

Illustrations: Plate IV.

Arctopsyche ladogensis (Kolenati)

Aphelocheira ladogensis n. sp., 1859 Kolenati p. 201, pl. 1 fig. 4. *A. ladogensis* Kol., valid species, 1864 Hagen p. 805. *Arctopsyche ladogensis* (Kol.), genotype, 1868 M'Lachlan p. 301; valid species, 1872 M'L. p. 68, 1878 McLachlan p. 378, 1907 Banks p. 48, 1907 Ulmer p. 178, 1932 Ulmer p. 210, 1934 Betten p. 180, 1936 Milne pp. 66, 67.

Arctopsyche obesa McLachlan nec Hagen, 1878 McLachlan p. 379; *A. obesa* McL., synonym to *Aphelocheira ladogensis* Kol., 1936 Milne p. 67.

Arctopsyche ramosa McLachlan nec Hagen, 1878 McLachlan, p. 379; *A. ramosa* McL., synonym to *Aphelocheira ladogensis* Kol., 1936 Milne p. 67.

Types: Several of *Aphelocheira ladogensis* Kol., from Lake Ladoga and River Neva, North Russia, the specimens distributed to the museums of "Petropoli, Vindobonae Beolini, Hafniae, Holmiae," with at least one retained in the author's collection, now supposedly divided between Leningrad and Prague. Holotype ♂ of *Arctopsyche ramosa* McL. in the Museum of Comparative Zoölogy, "Slave Lake, Hudson's Bay Territory, 1864, Kennicott."

Material examined: 4 ♂♂ adults, including the holotype of *A. ramosa* McL., and a topotype mentioned by McLachlan (1878) as typical ladogensis. Also one from "Mile 412, Hudson Bay Railway, Manitoba, 15–VI–1932," and one from "White Mts., N. H., 1–3: VI."

Description

Adult: Head reddish brown, with brownish white and white hair; basal antennal segment reddish yellow, darker than flagellum; palpi brownish yellow. Prothorax dark reddish brown, coxae reddish yellow, femora somewhat paler, tibiae and tarsi yellow. Mesonotum blackish, scutellum slightly paler with yellowish hair; pleura and coxae dark reddish yellow, legs otherwise paler; tegula brownish with mostly yellowish hair, some brown; wing yellow, too much rubbed in all specimens for comments on vestiture. Metathorax and coxae dark reddish yellow, legs paler, tibiae yellowish white, coxae slightly darker; hind wings yellow, veins concolorous, membrane with short, yellowish brown hair. Abdomen dark brown, genitalia golden.

Illustrations: Plate IV.

Parapsyche Betten

Hydropsychidae: Parapsyche n. gen. for *Arctopsyche apicalis* Banks (1908), haplotype, 1934 Betten p. 181.

Arctopsychidae: Parapsyche (Betten), valid genus, 1936 Milne, pp. 66, 67.

Species: P. apicalis (Banks), 1908 genotype; *elsis* Milne, 1936.

Distribution: North America, especially the cooler parts.

Palpi as in *Arctopsyche*. Outer protibial spur very slim, twice as long as tibial diameter, two-thirds the length of its mate. Mesotibial subapical spurs at tibial midpoint, the outer nearly thrice as long as tibial diameter, three-fifths as long as the inner, subequal to inner apical, which is one-third longer than its mate. Metatibial outer subapical spur slightly shorter than its mate, one and one-half times its own length before apicals, subequal to inner apical, which is one-quarter longer than the outer, four times as long as tibial diameter. No indication of retained larval gills on the abdominal pleura. Female mesotibiae not flattened. Male eighth sternite with a convex projecting posterior margin, forming a shelf under genitalia. This genus is close to *Diplectrona* of Hydropsychidae and may form a connecting link between the two families.

Parapsyche apicalis (Banks)

Arctopsyche apicalis n. sp., 1908 Banks p. 266. *Arctopsyche apicalis* Banks, valid species, 1926 Sibley p. 104, 1926 Betten p. 524 (with note that it should be in a new genus), 1927 Johnson p. 50.

Parapsyche apicalis (Banks), haplotype, 1934 Betten p. 181, pl. 16 figs. 14–18, pl. 17 figs. 1–2. Valid species, 1936 Milne pp. 66, 67.

Types: Holotype ♂, allotype ♂ of *Arctopsyche apicalis* Banks in the Museum of Comparative Zoölogy, "Franconia, N. H." and "Fourth L., Fulton Chain, 12–VII," (N. Y.), respectively, both "Type 11515."

Material examined: 22 adult specimens including the above mentioned types, from Colo. (Manitou), Mass. (no locality given), N. H. (Franconia, Mt. Washington, Glen House, Randolph, White Mts.), N. Y. (Fourth L., Tompkins Co.), N. C. (Nellie), N. S. (Digby), and U. S. A. (no locality). These were taken in June (10 specimens), July (3), August (1) and on unrecorded dates (8). All but two were males.

Description

Adult: Head dark brown, posterior warts elevated, paler, with dark hair; vertex with yellow hair, eminence with a median longitudinal furrow; face with dark hair; eyes rather large; antennae yellowish, basal segment with a little dark hair; palpi brownish. Pronotum mostly covered by brownish yellow warts bearing yellow hairs; pleura and legs brownish yellow. Mesonotum reddish yellow, scutellum concolorous, both with yellowish white hair; pleura and legs yellow; wing base brownish yellow, tegulae with brown hair; wing grayish yellow, with small patches of appressed yellow hair among the dark brown covering. Metanotum pale reddish yellow; pleura and legs yellow, the tibiae whitish; hind wing yellowish gray, vestiture short. Abdomen dark reddish brown, genitalia more yellowish in ♂, concolorous to pale grayish yellow ventral surface of abdomen in ♀.

Illustrations: Plate V.

Parapsyche elsis Milne

Parapsyche elsis n. sp., 1936 Milne pp. 66, 67.

Types: Holotype ♂ "Cultus L., B. C. 8–VII–1934, W. E. Ricker" in the Milne collection. Four ♂ paratypes, 1 in the Museum of Comparative Zoölogy. "Black Mts., N. C., V," 1 in the Canadian National Collection, "Revelstoke, B. C., 14–VII–1931," two in the Milne collection, "Banff, Alta., 5–VII–1922" and "Bellnap Springs, Ore., 23–VI–1930."

Material examined: Only the five male types are known, from Alta., B. C., N. C. and Ore.

Description

Adult: Head yellow, posterior warts concolorous, with brownish yellow hair; face with brown hair; antennae yellow; maxillary palpi brownish yellow, basal segment with some long, yellow, stout hairs; labial palpi very slender, reaching to about midpoint of second segment of maxillary pair. Prothorax yellow, warts concolorous, separated by an abrupt median fissure, each bearing considerable yellowish white hair; legs yellow, tibiae with a few scattered, short, subappressed, yellow spines. Mesonotum brownish yellow, with a broad median furrow, otherwise very convex, the summit of each convexity with considerable, very short, suberect, brown hair; scutellum yellow, with a little similar brownish erect hair; pleura and legs yellow, tibiae and tarsi with a little brownish hair, a few short, subappressed, yellow spines on tibiae; tegulae yellow, with concolorous hair, wing yellowish, veins concolorous, membrane with rather scanty, short, appressed, brownish hair, with many small patches of yellowish scattered among it. Metathorax and legs yellow; hind wings colored as fore pair, the hair on them all brown. Abdomen dark brown above, yellow on sides and below; genitalia yellow.

Illustrations: Plate V.

UNIDENTIFIED LARVAE (see key)

Type 1a: Two specimens from "Reservoir Creek, Cultus L., B. C., 30–V–1935," each 13 mm. long, 2 mm. at the widest. Similar to *Arctopsyche grandis* (Bks.) except for the lack of lateral line gills on the 2nd abdominal segment.

Type 2: Five specimens from "Jasper National Park, Alta., 15–VIII–1936, C. T. Brues," and one from "South Fork, McKenzie River, Ore., 5–IX–1932, R. E. Dimick." The former specimens measure 12 to 20 mm. long, 2 to 3 mm. broad, while the latter specimen measures 21 mm. long, 5 mm. broad.

Type 3: One each from "Luinchin Creek, Cultus L., B. C., 19–V–1935, W. E. Ricker" (20 mm. long, 4 mm. wide), "Reservoir Creek, Cultus L., B. C., 30–V–1935, W. E. Ricker" (21 mm. by 4 mm.), "Canyon Creek, Glacier, Wash., 9–VII–1935, W. E. Ricker" (15 mm. by 2 mm.), and 14 from "Camp Creek, Mt. Hood National Forest, Ore., 2–VIII–1933, R. E. Dimick" (10 to 20 mm. long, 1–3 mm. broad).

Type 4: One specimen from "Luinchin Creek, Cultus L., B. C., 19–V–1935, W. E. Ricker" measuring 10 mm. long, 1.2 mm. broad.

The forty-three larvae studied agree in the following characters, which separate them from Hydropsychidae, Polycentropodidae and Philopotamidae.—A quadrate gula instead of a triangular gula; gills in a Hydra-like clump, not with filaments spread along the side of the stalk as in Hydropsychidae or absent as in the other two families; a triangular plate on the proepimera as in Hydropsychidae, lacking in Philopotamidae and differing in shape from the type found in Polycentropodidae; sclerotized pro-, meso- and metanota as in Hydropsychidae, but not in the other two families.

The four pupae studied agree in having the same type of gill clumps as in the larvae, a character which makes them easy to separate from all other caddis pupae.

Hoplia equina LeConte.—The occurrence of this beetle in very unusual numbers was noticed at Berlin, Mass., on June 29, 1937. By sweeping the grass at the foot of a high embankment on the Wachusett Aqueduct, 148 males and one female were taken in an area about 1000 feet long by 30 feet wide. They were taken about 11 A. M. and many were seen to be near or at the tops of the grass stems, perhaps preparing for flight. Two days later not one specimen could be found in this place though a few males and two females were taken about half a mile away.—C. A. FROST, Framingham, Mass.

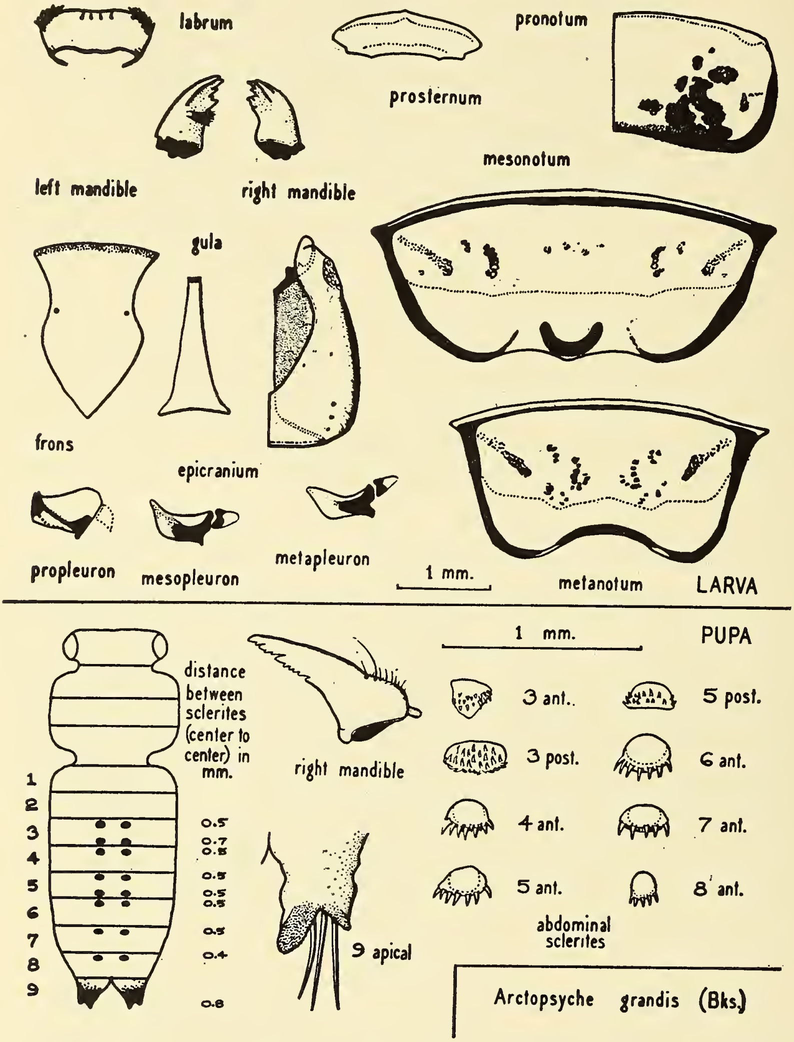

labrum
prosternum
pronotum
left mandible
right mandible
mesonotum
gula
frons
epicranium
propleuron
mesopleuron
metapleuron
1 mm.
metanotum
LARVA
1 mm.
PUPA
distance between sclerites (center to center) in mm.
1
2
3
4
5
6
7
8
9
0.5
0.7
0.8
0.5
0.5
0.5
0.5
0.4
0.8
right mandible
9 apical
3 ant..
3 post.
4 ant.
5 ant.
5 post.
6 ant.
7 ant.
8 ant.
abdominal sclerites
Arctopsyche grandis (Bks.)

Plate III: Larval and pupal sclerites of *Arctopsyche grandis* (Bks.), drawn from the metamorphotype described. Structures of the right side only are shown, except in the case of undivided sclerites extending across the body, and except for the left mandible, which has a special tuft of bristles. The prosternum and gula are ventral views, the pleura lateral views, all others are from the dorsal aspect.

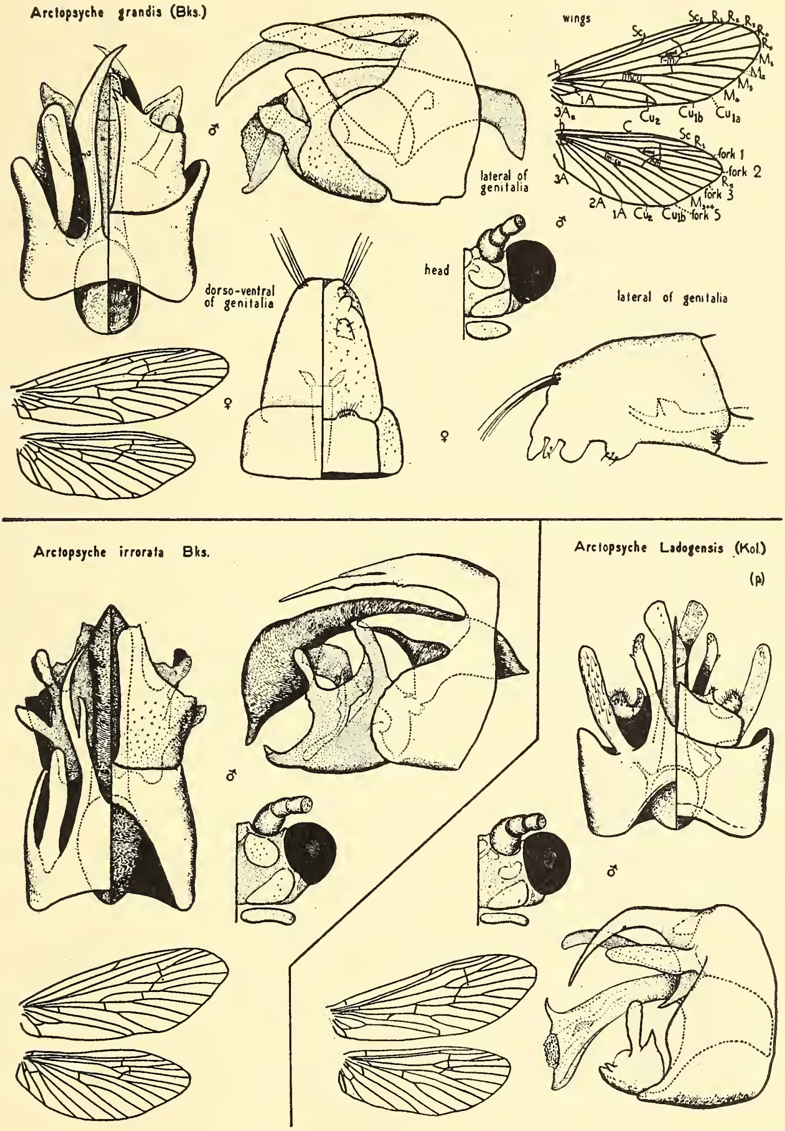

Arctopsyche grandis (Bks.)
♂
lateral of genitalia
wings
Sc1
Sc2 R1 R2 R3 R4
R5
M1
M2
M3
M4
h
1A
3A
Cu2
Cu1b
Cu1a
h
C
Sc R1
fork 1
fork 2
Rs
fork 3
3A
2A
1A
Cu2
Cu1b
M3+4
fork 5
♂
head
dorso-ventral of genitalia
lateral of genitalia
♀
♀
Arctopsyche irrorata Bks.
♂
Arctopsyche Ladogensis (Kol.)
(p)
♂

Plate IV: Adult structures of the three North American species of *Arctopsyche.* In each case, only the structures of the right side are shown. The divided drawings of the genitalia have the dorsal view illustrated on the left half, the ventral on the right half, *i.e.,* the apex of the abdomen is toward the top of the page. Internal structures are indicated by dotted lines.

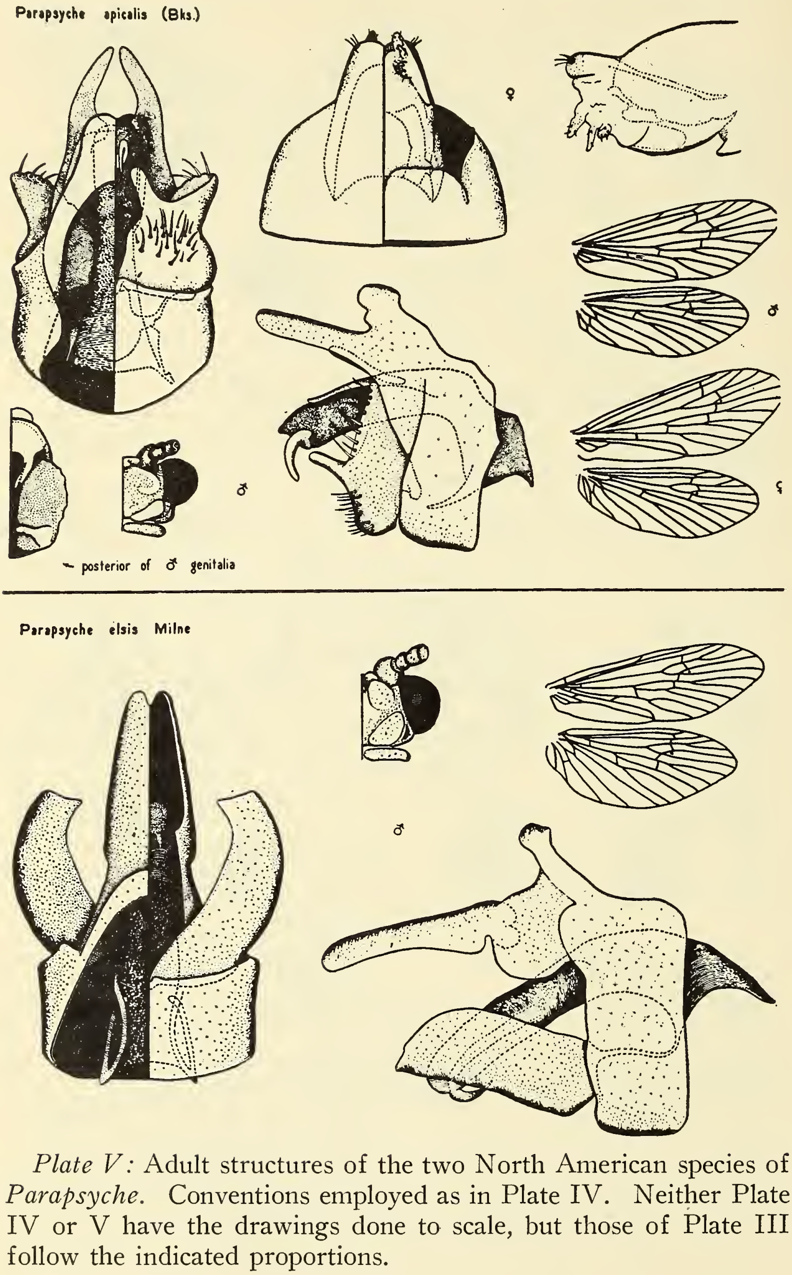

Parapsyche apicalis (Bks.)
♀
♂
♀
♂
– posterior of ♂ genitalia
Parapsyche elsis Milne
♂

Plate V: Adult structures of the two North American species of *Parapsyche*. Conventions employed as in Plate IV. Neither Plate IV or V have the drawings done to scale, but those of Plate III follow the indicated proportions.

LIFE HISTORY OF CALEPHELIS MUTICUM (McALPINE); LEPIDOPTERA.

By Wilbur S. McAlpine, Birmingham, Michigan.

Calephelis muticum (McA.) was described in the April, 1937, issue of this publication. As noted in that issue this little butterfly had been mistaken for *Calephelis borealis* (G. & R.) by many lepidopterists, including the author, and its discovery was a direct result of the following life history work and comparison with similar work on *Calephelis borealis* (G. & R.) by Cyril F. dos Passos, as published in August, 1936, issue of the *Canadian Entomologist*. Mr. dos Passos very kindly assisted in this comparison and furnished the author with specimens of *borealis* together with egg and caterpillar molts of various stages. Mr. J. F. Gates Clarke, of the National Museum, prepared genitalic slides of both species which further showed conclusively the distinctness of the two.

Through the kind co-operation of several lepidopterists, acknowledged in my paper of last year, the distribution of *Calephelis muticum* as recorded at that time was as follows: In southern Michigan near Detroit and Three Oaks; in Wisconsin near Milwaukee; in Illinois near Chicago; in Ohio near Columbus, and in Missouri near Willard. Its range has been further extended during the past year by collection of several specimens by the author at Lamberton Lake near Grand Rapids, Michigan, and by the record of one specimen collected by R. L. Chermock in July 26, 1932, near Pittsburgh, Pennsylvania.

Observations on this little butterfly extend through several seasons and were made mostly in one locality, Bloomfield Hills, Michigan, which is located about twenty miles northwest of Detroit. It was first found there many years ago by Dr. W. W. Newcomb, of Ann Arbor, Michigan, an ardent lepidopterist, to whom I am greatly indebted for assistance and encouragement in this work. This particular habitat (on Barbour Estate) is in the rather broad valley of a small stream, a branch of the River Rouge, in which there is a medium sized swamp and springy area. Tamarack trees predominate in the swamp area and marsh grasses, shrubby cinquefoil, and small shrubs and bog vegetation are found on the open springy ground. The surrounding country is hilly or rolling and when wooded the usual hardwoods predominate. The whole area may be classed as typical glacial morainic belt region, with many small lakes, streams, hills and swamp areas. *Calephelis muticum* was found in small numbers in the open springy area adjoining the small stream. The butterflies are weak fliers and are easily caught while flying around among the lower marsh plants and grasses. They were occasionally attracted to the flowers of the yellow daisy and shrubby cinquefoil. When resting they spread their wings showing the upper surface.

As far back as August 1, 1915, its food plant, the swamp thistle, was discovered by the author, by noting oviposition by a female in the field. Ninety fertile eggs were obtained from three females confined over this food plant at that time. My records show that forty-two eggs were laid by one of these females. The early caterpillar stages were observed at this time but efforts to carry the caterpillars through the winter of 1915 and 1916 were unsuccessful. Observations were made, however, in the spring of 1916 on caterpillars found in the field and five were reared to maturity, chrysalis and imago, but there was some question as to the exact number of caterpillar stages. A very few fertile eggs were obtained in late summer of 1916 and early caterpillar stages were noted again but as in the previous winter I did not succeed in carrying them through the winter. No further life history work was done on this butterfly until the summer of 1930 when forty fertile eggs were obtained at the Bloomfield Hills bog by confining females over the food plant. Of this batch four caterpillars were carried through the winter of 1930 and 1931 and complete records were obtained of these to imago. Again in the summer of 1936 a dozen fertile eggs were obtained from the Willis swamp (type locality of male holotype). This swampy area is located at the northeast corner of Crane and Willis roads in Washtenaw County about five miles southwest of Ypsilanti. This habitat is a rather small open, marsh-grassy area, formerly part of or adjoining tamarack swamps, with small water courses running through it and which is now being grazed over by cattle. A few years ago the butterfly was very common here but last year very few were noted, due I believe to the cattle grazing and consequent destruction of food plant. Of this batch of eggs, four were carried through the winter of 1936 and 1937 and complete records were obtained of these through to chrysalis and imago. My records indicate that one of these caterpillars molted eight times (or had nine instars) before going into chrysalis, while all other complete records of caterpillars of this butterfly indicate but seven molts or eight caterpillar instars. Mr. dos Passos records a similar apparent abnormal ninth instar of one caterpillar in his life history of *Calephelis borealis*. There seems to be considerable irregularity in the length of time spent by caterpillars in the various instars which I believe is largely due to variation in weather conditions during different years.

The life history of *Calephelis muticum* may be briefly stated as follows: It is single brooded, and the flying season in this vicinity is for about two weeks, between July 10 and August 10, depending upon the season. The natural food plant is the swamp thistle (*Cirsium muticum*), although I have succeeded in raising caterpillars on the bull thistle. The egg is usually laid on the underside of the leaf on the lower half, either on top of the midrib or along the edge of it. The smaller and younger plants of the swamp thistle, which are more hairy on the underside of the leaves and which grow on slightly dryer ground, are preferred. The eggs are usually laid the latter part of July in this vicinity and the duration of egg stage is from 16 to 28 days. The caterpillar molts three or four times, usually the latter number, before going into hibernation for the winter. It hibernates at the base of the smaller leaves of the swamp thistle. The frosts do not seem to kill these smaller leaves, but the larger ones die down, leaving only a rosette of small, very hairy leaves, that lie down rather flat and close to the ground and overlap each other. The caterpillar eats off a few of the hairs on the under side of one of these smaller leaves, and on the lower half of the leaf, making a little pocket or clearing about the size of the caterpillar, where it hibernates for the winter. With the first continued warm weather of the spring, usually from April 15 to May 15 in this vicinity, the caterpillar becomes active and starts to feed. Four caterpillars which I succeeded in carrying through the winter of 1930 and 1931, all molted four times before hibernation and molted three more times in the spring before the final molt upon going into the chrysalis, which was from July 1 to July 4. These hatched into the butterfly from July 13 to July 17. From observations, under natural conditions, the chrysalis is not usually attached to its own food plant, but to the underside of some small leaf close to the ground, such as a violet leaf, and within six or eight inches of the swamp thistle, upon which it fed. The chrysalis is covered with the white hairy matted mass of the last molt, which gives it the appearance of being enclosed in a loose white hairy cocoon.

There are some interesting habits and characteristics of the caterpillar which are worthy of note: (1) The caterpillar in emerging from the egg, eats a round hole through the central micropyle, leaving the balance of the egg intact, no effort being made to eat it. (2) The caterpillar seldom eats any portion of the molted skin and no difficulty was experienced in finding this, as it is usually fairly well fastened by little hooks on the prolegs, to the food plant. (3) The caterpillar is sluggish, does not move around very much, and does not eat as ravenously as most caterpillars do. During its earlier states it feeds on the fleshy leaf tissue on the underside of the leaf, leaving the tougher upper skin of the leaf intact, causing this skin to dry up and look like white transparent patches on the leaves, thus making it easy to detect the caterpillar on the plant. In the later stages it eats completely the tenderer part of the leaf, which is the outside edges. At rest the caterpillar is usually found on the underside of the leaf and close to the midrib. (4) Some difficulty was experienced in keeping the hibernating caterpillars through the winter, but I finally was successful by leaving them on their food plant, outside, and under natural conditions as much as possible. An easy way to obtain perfect specimens of the butterfly is to obtain the larvae in its last state, when they are readily detected on the food plant during the latter part of June. No enemies of the caterpillar were detected. (5) As noted in the drawings, the appearance of the caterpillar is very interesting because of the two mid-dorsal rows of long white hairs which extend upward, as well as the long white lateral, depressed hairs which form a complete fringe around the caterpillar. In trying to remove the caterpillar from the leaf, one may sometimes experience a little difficulty, as these long white lateral hairs flattened against the leaf, help the caterpillar to retain its hold. At other times, particularly in the earlier stages, the caterpillar when disturbed, will curl up and drop to the ground. (6) An interesting feature of the clothing of the caterpillar is the numerous minute vitreous sprocket-shaped processes, which cover the dorsal surface in all stages except the first. These processes give the surface a whitish or pubescent appearance when not under magnification, the usual ground color of the caterpillar being a pale bluish green, with no other coloring or markings. (7) The arrangement of spiracles on first thoracic and first abdominal segments, just below the lateral warts which support the long horizontal white hairs is perhaps unusual. In the former they are located at posterior edge of segment while in latter at anterior edge.

Egg:

Turban shaped—the color is a delicate coral pink or carrot red when first laid, becoming waxy white just before hatching. It is firmly attached at its base to the leaf, by a vitreous secretion. Its surface is a vitreous raised network of five, six, seven and eight-sided cells, which are arranged in concentric rows about the central micropyle. The cells are largest near the micropyle and progressively becoming smaller and less prominently raised toward the base of the egg, where they are practically obliterated. The intersections of the cell network are enlarged into blunt thickened knobs, while the ridges between are thinner and lower. The base of the egg is flattened, while its top is depressed and cut off squarely to form a broad shallow pit with radiating cells as sides, whose bases are joined and thickened to form a slightly raised circular rim about a very fine network, which forms the central micropyle. These radiating cells are usually eleven, though sometimes twelve in number and are generally five sided, though occasionally one or two are six sided. There seems to be a great variation in arrangement and number of different sided cells, no two eggs being exactly alike. Size of Egg—Vertical 0.3 mm., Horizontal 0.6 mm. Duration of state—16 to 28 days—July 15 to August 10. Number observed 90.

NOTE: In the following description of caterpillar instars the average length of caterpillar is measured from front of head to end of last segment at beginning of instar, while the dates indicated are approximate for vicinity of Detroit, and vary considerably from season to season.

First Instar:

Length about 1.3 mm., ventral side flattened, dorsal side rather wedge shaped, being somewhat flattened in mid-dorsal area. The dorsum is highest at first abdominal segment, head oval, nearly as broad as front of first thoracic segment, face very finely granulated and bearing a number of colorless bristles, ocelli black in crescent cluster, mandibles and labrum brown, color of head pale lemon yellow, shining, not retractile. The caterpillar when first hatched is of a dull whitish clay color on dorsal surface, but after feeding becomes whitish green and between segments darker green. Spiracles white, turning yellowish toward latter part of instar. Thoracic feet and prolegs pale lemon yellow, shining. Ventral surface pale lemon yellow. A conspicuous feature of the caterpillar is the two mid-dorsal rows of long white hairs which extend upward and backward and a lateral row of long white hairs which form a complete fringe around the caterpillar. These long white hairs, under considerable magnification, have rather blunt points, are round and are covered with very minute bristles, often brownish in color, giving a light brownish tinge to some of these long hairs. The dorsal surface between the long white hairs is very minutely granulated. There are low tuberculated warts or enlargements along mediodorsal line on each segment, which support long whitish hairs. The first thoracic segment is narrowed in front and somewhat flattened middorsally, to form a shield shaped wart or process, with a thickened rounded rim along the front, which supports long whitish hairs that project out over the head. There are sixteen such projecting white hairs, half of which are quite long, the longest being about 0.7 mm. From second thoracic to eighth abdominal segments inclusive the mediodorsal warts support two rows of tubercles, one on each side of mediodorsal lines from which arise the long whitish hairs. These hairs extend about 0.3 mm. above dorsum. On first and second thoracic segment there is one such hair on each side of mediodorsal line, while from first abdominal to eighth abdominal there are two such hairs. The ninth abdominal segment is much narrower and more flattened out and from its outer thickened edge, long whitish hairs project out horizontally and upward, ten in number, the longest being about 0.8 mm. in length. Just below the anal opening are two featherlike spines which are downward projected and are used for throwing the excrement away from the caterpillar. When the excrement is passed, it falls on these spines, the caterpillar then jerks its abdomen upward and throws the excrement usually over its head. The substigmatal fold so called consists of somewhat horizontally flattened warts or enlargements, one to each segment from second thoracic to eight abdominal. These warts or enlargements each support a pencil or tuft of long horizontally projected whitish depressed hairs which together with hairs on first thoracic and ninth abdominal segments form a continuous fringe around the caterpillar. These lateral warts on second and third thoracic segments support a pencil of three long white hairs, while the lateral warts on first abdominal support four, and on second abdominal to seventh, five such hairs, one of which is very short and downward projected, and on eighth abdominal seven such hairs. Just above the prolegs on first, second and third thoracic segments is a fork of two short white hairs while midway between mid-dorsal and lateral warts on second and third thoracic segments is a small colorless bristle. The arrangements of spiracles is interesting and has been referred to previously. Duration of stage from 11 to 16 days—Aug. 9 to Aug. 20. Caterpillars observed 40.

Second Instar:

Length of caterpillar about 1.9 mm. Shape of caterpillar and arrangement of warts and tubercles as in first instar, although dorsal and lateral tubercles supporting long whitish hairs are now more prominent, making sutures appear more deeply cut. The long whitish hairs of mediodorsal area and lateral fringe are much more numerous than in preceding stage. The hairs on mediodorsal warts from second thoracic to eighth abdominal segments are more numerous and not nearly so long in proportion to height of body and are projected more directly upward than in preceding stage. The tubercles located on mediodorsal warts or enlargements from second thoracic to eighth abdominal segments are arranged as in former stage and now each supports a pencil or tuft of long whitish hairs instead of single hairs. A new element in the clothing of the caterpillar appears for the first time. The dorsal surface between the mediodorsal long hairs and lateral fringe is now studied with minute sprocket shaped vitreous processes, scarcely raised above the surface, which give a whitish or velvety appearance to latter. Most of these processes have six rays, although some have five, seven or even eight or nine rays of more or less regular length. At the center of each process is a slight round depression. Just below the anal opening are two pencils of four short hairs, downward projecting which replace the feather like ones of preceding instar. Color of caterpillar, dorsal surface, withitish green. Head smaller and narrower than in preceding stage, color pale lemon or cream. Duration of stage from ten to thirteen days —August 20 to September 1. Caterpillars observed 32.

Third Instar:

Length 2.8 mm., general shape, color and arrangements of tubercles and hairs as in preceding stage, only there are more hairs on all the tubercles. These hairs on the mediodorsal tubercles are a trifle longer and slope more backward than in preceding instar. The sprocket-shaped processes are more numerous on the dorsal surface. Duration of stage from eleven to sixteen days—September 1 to September 15. Caterpillars observed 30.

Fourth Instar:

Length 3.4 mm., general appearance, shape, color and arrangement of tubercles and hairs as in preceding stage. The dorsal and lateral hairs are slightly longer and more numerous. The sprocket shaped processes are more numerous over dorsal surface. There are very small pits which appear as dark spots on each segment, from second thoracic to eighth abdominal, between the lateral and dorsal rows of hairs. There are about three or four of these to each segment. These were not noted in preceding stage. Spiracles are pale yellow. There are a number of short white bristles on the prolegs and thoracic feet. Often on the dorsal surface there is a small white bristle near each spiracle or along the edge of the segmental sutures, just below the spiracles. The mediodorsal warts on the abdominal segments in addition to supporting tubercles with long white hair, also bear a number of very small flat rounded, dark, shiny tubercles, which lie on each side of medial dorsal line between the hair bearing tubercles. Duration of stage nineteen to twenty-five days. Some caterpillars may hibernate through the winter in this state—September 5 to October 5. Caterpillars observed 25.

Fifth Instar:

Length 4.3 mm., general shape, color and arrangement of tubercles and hairs as in preceding stage. The dorsal and lateral hairs are a trifle shorter in relation to body. Hibernation through the winter usually occurs in this stage. The dorsal surface besides being studded with the vitreous sprocket shaped processes, is scattered in spots with very minute raised black dots between the latter, which appear like dark patches under low magnification. As before noted, the dorsal surface has always been very finely granulated, but not until this stage have any considerable number of these granulations been black. I noted a few in the fourth instar and from my observations it would appear that practically only hibernating caterpillars, have the patches of black granulations. The long dorsal and lateral hairs of caterpillars which have hibernated through the winter have a yellowish or ochre appearance. Besides hibernation through the winter in this stage, an average of twenty days before hibernation in the fall and fifteen days after hibernation in the spring is spent in this stage, October 5 to May 20. Caterpillars observed 22.

Sixth Instar:

Length 5.8 mm., similar in shape to, color and arrangement of tubercles and hairs as in, preceding instar. The middorsal hairs are longer in proportion to body. The black granulations are absent, sprocket shaped processes and white hair are more numerous. Duration of stage from nine to eleven days—May 25 to June 8. Caterpillars observed 8.

Seventh Instar:

Length 7.2 mm., caterpillar similar to preceding stage, only middorsal hairs are not so long in proportion to body. In its latter stages the caterpillar becomes more flattened or slug shaped and its head is inclined to be somewhat retractile. Its general appearance except for long white hairs is becoming more similar to Lycaenid larvae. Duration of stage from twelve to seventeen days, June 8 to June 25. Caterpillars observed 8.

Eighth Instar:

Length 10.5 mm., just after seventh molt and 15 mm., at end of instar; hardly distinguishable from preceding instar except for size. The drawings as illustrating the fourth and sixth instars are very similar to this stage except that the long hairs on mediodorsal tubercles slope more backward. The caterpillar is inclined to wander off its food plant after becoming full grown, to pupate. Duration of stage from thirteen to sixteen days—June 25 to July 10. Caterpillars observed 8.

Ninth Instar (probably abnormal):

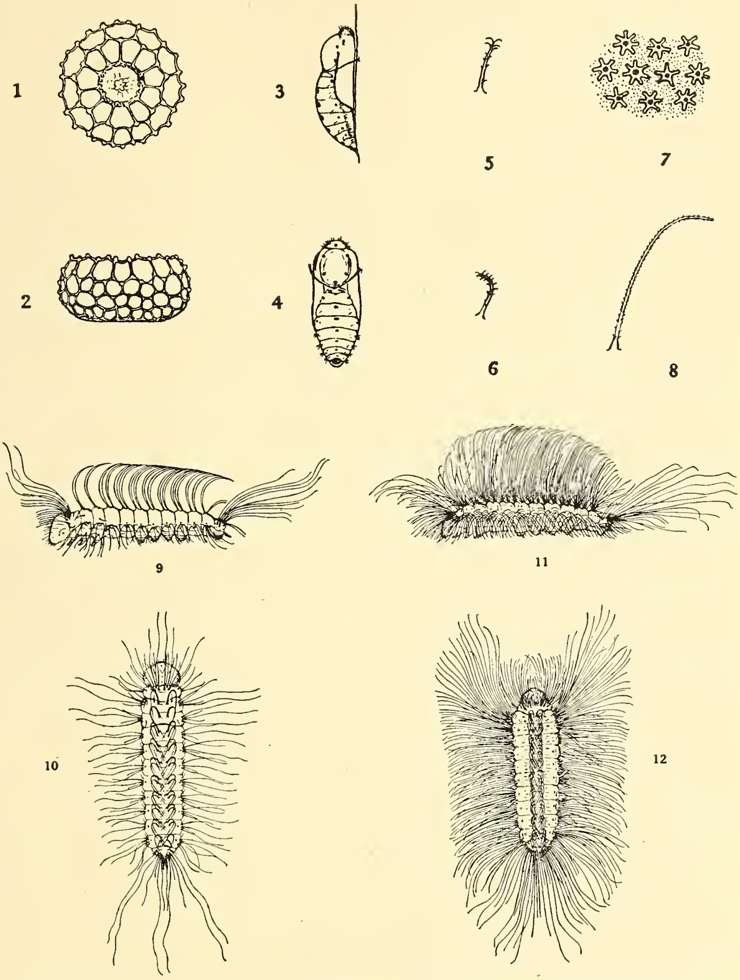
As noted before only one caterpillar was observed as having reached this instar. This caterpillar was eleven days in eighth instar and twelve days in ninth instar. General appearance of caterpillar same as in eighth instar. Length of mature caterpillar 16 mm.

Chrysalis:

Length 9.8 mm., greatest breadth across abdomen near end of wing cases 3.9 mm., breadth across mesothorax 3.5 mm. Dorsal surface rounding or cylindrical, while ventral surface is somewhat flattened, especially so in abdominal segments. Abdomen rather long, sloping gradually to posterior extremity which is flattened slightly to form cremaster, the latter being small and provided with minute hooklets. Head case rather squarely cut off, sides rounded. Thoracic area rounded, short and considerably elevated. Along edge of headcase is a fringe of minute colorless branching or hooked bristles. On dorsal surface of thorax are scattered minute colorless hooked bristles. Spiracles occur on second, fourth, fifth, sixth and seventh abdominal segments. Just below each spiracle on fourth, fifth, sixth and seventh segments is a tuft of minute colorless hooked bristles which occur also on eighth abdominal segment.

Scattered minute branching colorless bristles occur on surface of abdomen, more thickly placed on mediodorsal area. Coloration of thorax, headcase and wing covers, pale water green, abdomen a lighter yellowish green. There is a mediodorsal row of small black spots on abdominal segments, also small black spots on thorax and headcase as indicated in drawing. Spiracles black, being more conspicuous and ringed with black on second abdominal segment. Out of seven chrysalides, five conform very closely in coloration with above description, but the other two in addition are mottled more or less with dark green or blackish blotches on abdomen and thorax, but not on wing cases. The chrysalis is suspended by a silken girdle at suture between thorax and abdomen, and is rather closely compressed to surface on which pupation occurs. It is rather evenly covered with the matted mass of cast off long white hairs, star like processes and other exuviae of the last caterpillar stage, which gives it the appearance of being enclosed in a loosely woven hairy cocoon. The cast off hair and exuviae are held in place around the chrysalis by the minute hooked bristles on the surface of the latter. A day or so before the butterfly emerges from chrysalis, the wing covers first, then thoracic region become black, the butterfly emerges through a neat slit along mediodorsal line of thorax and head case, leaving the cast off pupa case practically intact. Duration of stage ten to fourteen days—July 2 to July 22. Specimens observed 7.

A comparative study of the life histories of *Calephelis muticum* and *Calephelis borealis* would indicate they were quite similar. As noted the food plants are different, *muticum* feeding on the swamp thistle (*Cirsium muticum*) and *borealis* feeding on *Senecio obovatus* according to Mr. dos Passos; the former being found in low swampy ground while the latter on higher ground. The eggs are very similar, while the caterpillar stages are also very similar both in appearance and length of stages. One marked difference in appearance of caterpillars is that there are no markings whatever on caterpillars of *muticum* while there are small black spots on dorsal surface of certain segments of *borealis* caterpillars, as recorded by Mr. dos Passos, during most of its stages. The chrysalis with its cocoon like covering of cast-off hairs and exuviae of last caterpillar stage is very similar in both species. The flying period of *borealis* is early part of July while *muticum* is usually later in July or first part of August.



1 and **2.** Egg, size horizontal 0.6mm.; **3** and **4.** Chrysalis length 9mm.; **5.** Substigmantal bristle on chrysalis greatly enlarged; **6.** Head bristle on chrysalis greatly enlarged; **7.** Sprocket shaped processes greatly enlarged; **8.** Typical long dorsal hair greatly enlarged; **9** and **10.** Larva First Instar length 1.3mm.; **11.** Larva Sixth Instar length 5.8mm.; **12.** Larva Fourth Instar length 3.4mm.

Drawings by W S. McAlpine

Early stages of *Calephelis muticum* McA.

NOTES ON THE *PASSALOECUS* OF NEW YORK STATE WITH DESCRIPTIONS OF TWO NEW SPECIES (HYMENOPTERA: SPHECIDAE)

By Karl V. Krombein, Buffalo, New York

During the last few years I have had occasion to study a number of specimens belonging to *Passaloecus* Shuckard with the result that several apparently new forms were discovered. Recently I had an opportunity to study the types of the species described by Rohwer in the United States National Museum and by Fox and Viereck in the Philadelphia Academy of Natural Sciences and find that the following two species have not been described previously. Except where noted the type material is retained in my collection for the present.

The following key will serve to separate the species found in New York State and should also be of use in determining material from east of the Mississippi River:

Key to the Species

1. Antennae with twelve joints, abdomen with six segments; females 2
   Antennae with thirteen joints, abdomen with seven segments; males 6
2. Anterior margin of clypeus tridentate medianly, not produced into a lobe: labrum, mandibles except apically and pronotal tubercles creamy-white; impressed lines on mesonotum not foveolate; mesopleura without a longitudinal series of foveolate impressions running caudad from the upper termination of the omaulus . . . . *mandibularis* (Cresson)
   Anterior margin of clypeus produced into a lobe medianly which is truncate or very slightly emarginate apically, and without teeth 3
3. Impressed lines on mesonotum usually noticeably foveolate; mesopleura with a longitudinal series of foveolate impressions running caudad from the upper termination of the omaulus; labrum and pronotal tubercles creamy-white; legs, except coxae, light ferruginous . . . . *relativus* Fox
   Impressed lines on mesonotum usually not noticeably foveolate; mesopleura without a longitudinal series of foveolate impressions running caudad from the upper termination of the omaulus although there may be a faint sulcus in this region 4

4. Labrum and pronotal tubercles creamy-white; legs, except coxae, light ferruginous .... *annulatus* (Say)
   Labrum and trochanters black 5
5. Pronotal tubercles black; scutellum shining, with sparser minute punctures; postocellar distance at most twice the lateral ocellar distance; size smaller, 5.0–6.7 mm. in length. **gertrudis** sp. nov.
   Pronotal tubercles white; scutellum opaque, with numerous minute punctures; postocellar distance two and one-half to three times the lateral ocellar distance; size larger, 6.7 mm. in length .... **ithacae** sp. nov.
6. Median antennal joints spinose beneath 7
   Median antennal joints rounded out beneath 8
7. "Eleventh joint of antennae much larger and broader than the others, angular, in consequence of which the two apical joints are turned backward. . . ." .... *distinctus* Fox
   "Eleventh joint of antennae not larger or broader than the others, not angular. . . ." .... *mandibularis* (Cresson)
8. Antennal joints with a conspicuous yellow spot at the apex beneath; legs, except coxae, ferruginous . . . *annulatus* (Say)
   Antennal joints concolorous, without a yellow spot at the apex beneath 9
9. Impressed lines on mesonotum usually noticeably foveolate; mesopleura with a longitudinal series of foveolate impressions running caudad from the upper termination of the omaulus; legs, except coxae, ferruginous ..... *relativus* Fox
   Mesopleura without a longitudinal series of foveolate impressions running caudad from the upper termination of the omaulus; trochanters black 10
10. Impressed lines on mesonotum not foveolate; pronotal tubercles black; postocellar distance less than the ocellocular distance, the ratio varying from .75–.91 : 1 .... **gertrudis** sp. nov.
    Impressed lines on mesonotum foveolate; pronotal tubercles creamy-white; postocellar distance greater than ocellocular distance, the ratio being 1.3 : 1 .... **ithacae** sp. nov.

P. mandibularis (Cresson)

Pemphredon mandibularis Cresson, Proc. Ent. Soc. Phila., IV: 451, 1865.

Forest Lawn, Buffalo, July 10, 1934 (K. V. Krombein); Ithaca, June 6, 1934 (K. V. Krombein); Ithaca, June 6, 1936 (J. G. Franclemont); Frontenac Point, Cayuga Lake, July 1–9, 1935 (J. G. Franclemont); Otsego Lake, July 3, 1935 (H. K. Townes).

P. relativus Fox

Passaloecus relativus Fox, Trans. Am. Ent. Soc., XIX: 319, 1892.

Millwood, June 20, 1936 (J. G. Franclemont); Farmingdale, L. I., Aug. 28, 1937 (K. V. Krombein; on scrub pine).

P. annulatus (Say)

Pemphredon annulatus Say, Boston Journ. Nat. Hist., I: 379, 1836.

Breesport, July 6, 1937 (H. I. Scudder); Ithaca, June 8, 1934 (K. V. Krombein); Frontenac Point, Cayuga Lake, July 1–15, 1935 (J. G. Franclemont); Onteora Mt., Greene Co., July 27, 1929 (L. O. Howard) [U. S. N. M.]; Shokan, July 13, 1936 (H. K. Townes); Farmingdale, L. I., Aug. 28, 1937 (K. V. Krombein; on scrub pine).

Of the specimens placed by Fox in *annulatus* (Say) in the Philadelphia Academy two males and one female are *relativus* Fox and the remaining females are *annulatus*.

P. rivertonensis Viereck (Trans. Am. Ent. Soc., XXX: 243, 1904) described from a male from New Jersey is doubtfully distinct from *annulatus*.

P. distinctus Fox

Passaloecus distinctus Fox, Trans. Am. Ent. Soc., XIX: 319, 1892.

This species is recorded from Ithaca, June 28 in the State List of Insects (Cornell Univ. Agr. Expt. Sta., Memoir 101, p. 1014, 1928).

Passaloecus gertrudis sp. nov.

Female.—5.4 mm. long. Black: mandibles except apices, apical joints of palpi and scape beneath, creamy-white; fore and middle tibiae and all tarsi beneath and base of hind tibia, tinged with fulvous; wings slightly infuscated, stigma and nervures fuscous.

Head subshining; clypeus very sparsely haired; face with sparse, appressed silvery hair and closely granulate; a small median spiniform tubercle just above the level of the antennal insertions; ocelli in a low triangle, the postocellar and ocellocular distances about equal and twice as great as the lateral ocellar distance; vertex with numerous minute punctures.

Thorax subshining, with sparse, short appressed silvery hairs; pronotum very short and transversely carinate dorsally;

mesonotum shining, with numerous minute punctures which are not so close together as in *P. ithacae* sp. nov.; notaulices are present on the anterior portion of the mesonotum and are not foveolate; suture between mesonotum and scutellum deeply impressed and slightly foveolate; scutellum polished with minute punctures which are more separated than those of the mesonotum; postscutellum punctured like the mesonotum; dorsal surface of the propodeum glabrous with irregular carinae presenting a reticulate appearance; posterior surface of propodeum with finer irregular carinae; mesopleura shining and sparsely punctured; omaulus and episternaulus deeply impressed and foveolate; metapleura shining; lateral surface of propodeum with finer oblique carinae anteriorly and with a few coarser oblique carinae posteriorly; legs covered with fine appressed hairs.

Abdomen shining, the first tergite with sparse minute punctures, the remaining segments with numerous minute punctures and abundant short appressed hairs.

Male.—4.8 mm. long. Similar to female except as follows: clypeus with abundant silvery appressed hairs; clypeus opaque and rather closely punctate; antennae with a series of tyloides beneath on segments four to ten; postocellar distance about three-fourths the ocellocular, the latter about three times as great as the lateral ocellar distance.

Type.—♀; Forest Lawn, Buffalo, New York; June 28, 1934; (K. V. Krombein).

Allotype.—♂; Forest Lawn, Buffalo, New York; June 13, 1935; (K. V. Krombein).

Paratypes.—1 ♂, topotypic, June 12, 1935 (K. V. Krombein); 1 ♀, topotypic, June 25, 1934 (K. V. Krombein); 1 ♀, topotypic, June 29, 1934 (K. V. Krombein); 1 ♂, topotypic, July 11, 1934 (K. V. Krombein); 1 ♂, topotypic, July 12, 1934 (K. V. Krombein); 1 ♀, Ithaca, New York, April 20, 1934 (K. V. Krombein; reared from burrow in sumach twig); 1 ♂, Ithaca, New York, June 1, 1937 (J. G. Franclemont); 1 ♂, Ithaca, New York, June 13, 1935 (J. G. Franclemont); 1 ♀, Oswego, New York, July 26, 1936 (K. V. Krombein); 1 ♀, Rosedale, Massachusetts, June, 1928 (R. L. Taylor; from burrows of *Pissodes strobi*) [U. S. N. M.]; 1 ♂, Boston, Massachusetts, June 16, 1928 (R. L. Taylor; from burrows of *Pissodes strobi*) [U. S. N. M.]; 1 ♂, Arnold Arboretum, Boston, Massachusetts, July 8, 1921 (H. Morrison; swept from *Vaccinium* spp. near entrance) [U. S. N. M.]; 1 ♂, same locality as preceding, July 14, 1921 (H. Morrison; swept from 5-leaf pines behind lab.) [U. S. N. M.].

Female paratypes vary from 5.0–6.7 mm. in length and differ from the holotype as follows: ratio of lateral ocellar to postocellar distances as 1 : 1.8–2.0, posterior margins of pronotal tubercles ferruginous in two specimens. Male paratypes vary from 4.3–5.1 mm. in length and differ from the allotypes as follows: the yellow spot on the scape beneath varies in size and is lacking on two specimens; tyloides present only on antennal segments five to nine in two specimens; postocellar distance varying from three-fourths to nine-tenths the ocellocular distance, the latter varying from two and one-half to three times as great as the lateral ocellar distance.

P. gertrudis is named for Mrs. Louis H. Krombein in grateful appreciation for all that one mother has done.

Passaloecus ithacae sp. nov.

Female.—6.7 mm. long. Black: mandibles except apices, apical joints of palpi, scape beneath and pronotal tubercles, creamy-white; tegulae apically, apices of fore and middle femora, all tibiae and tarsi beneath tinged with dark fulvous; wings hyaline, stigma and nervures fuscous.

Head opaque: clypeus with appressed silvery hairs basally which are directed medianly and a few scattered longer erect hairs on the medio-apical lobe; face with abundant appressed silvery hairs and closely granulate; a small median spiniform tubercle just above the level of the antennal insertions; ocelli in a low triangle, the postocellar and ocellocular distances equal and three times as great as the lateral ocellar distance; vertex with numerous minute punctures.

Thorax opaque with abundant short appressed silvery hairs; pronotum very short and transversely carinate dorsally; mesonotum with numerous close-set fine punctures; notaulices present on the anterior third of the mesonotum and noticeably foveolate; suture between mesonotum and scutellum deeply impressed and foveolate; punctures of scutellum slightly larger and more separated than those of mesonotum; postscutellar puncturation like that of mesonotum; dorsum of propodeum glabrous with irregular carinae presenting a reticulate appearance; posterior surface of propodeum shagreened and with finer irregular carinae; mesopleura subshining, with fine well-separated punctures, the omaulus and episternaulus deeply impressed and foveolate; metapleura shining; lateral surface of propodeum shagreened anteriorly and with a few oblique carinae posteriorly; legs covered with fine appressed hairs.

Abdomen shining with numerous minute punctures and abundant short appressed hairs.

Male.—5.2 mm. long. Similar to female except as follows: fore tibiae beneath and fore and middle tarsi entirely ferruginous; clypeus closely punctate and with numerous appressed silvery hairs; postocellar distance twice the lateral ocellar distance and almost one-third again as great as the ocellocular distance.

Type.—♀; Ithaca, New York; July 23, 1937 (J. G. Franclemont).

Allotype.—♂; Timagami, Ontario, Canada; June 10, 1932; (A. W. A. Brown) [U. S. N. M.].

Paratypes.—1 ♀, 1 ♂, Holden, Massachusetts, Aug. 8–10, 1905 (J. C. Bridwell) [♀ in U. S. N. M., ♂ in K. V. K.].

Other material examined.—1 ♀, 1 ♂, Itasca State Park, Minnesota, Sept., 1927 (S. Garthside) [U. S. N. M.]. Excluded from type series because of poor condition.

The paratypes differ from the type and allotype in having a more yellowish cast to the creamy-white markings; the female paratype also differs from the type in that the ferruginous on the legs is lighter and the postocellar and ocellocular distances are about two and one-half times as great as the lateral ocellar distance.

Courtship in Hesperidae.—During the summer of 1937 I several times noticed various species of Hesperidae engaged in courtship. Familiar as Lepidoptera are to me (I used to collect them), it was my experience that such activities are carried on during flight. But in the Hesperidae this appears to take place on or near the ground. On one occasion a male walked in circles about a female resting upon a grass stem, vibrating his outstretched wings as he walked. When the female moved to another location, he repeated this performance. The activity has been observed in several species, and generally resembles the description given above. I should welcome information as to whether this sort of mating procedure is general among Hesperidae and peculiar to that group. —Cyril E. Abbott, Chicago, Ill.

CALOSATURNIA ALBOFASCIATA SPECIES NOVA (LEPIDOPTERA, SATURNIIDAE).

By John Warren Johnson, Berkeley, Calif.

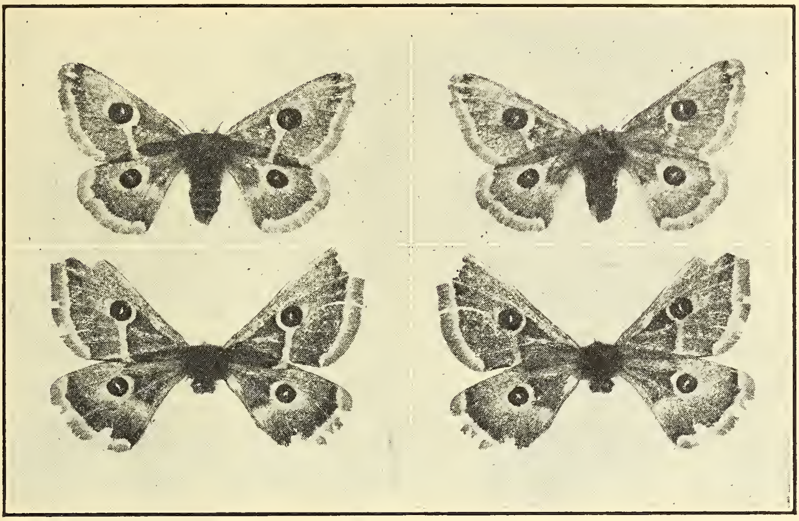
Holotype:

The moth as a whole dusky brown; the antennae pale yellow, singly bi-pectinate nearly to the tip; head small, retracted, of color of body; a prothoracic white collar above head between bases of forewings, somewhat concealed from above; thorax dorsum clothed in long, fine, dusky hairs darkest against white collar, hairs spreading over the wing bases and base of abdomen; abdomen clothed with short hairs and closely appressed scales of same tint as thorax; body of same tint below as above; legs light red above, brown below.

Wings:

Superior surface:

Forewings; fringes dusky; outer margin light brown, forming a broad border from apex to inner angle, defined inwardly by a broad white line from the subapical red patch to the inner angle; proximal to the white line the wing fuscous, shading to lighter brown against the discal white band; costal margin and wing anterior to ocellus and median nervules light gray, shading distally and posteriorly into the other wing tints; a discal white band, broadest anteriorly, extending from the base of the median vein to the inner margin, concentric with the ocellus on its proximal side, thence posterior from the ocellus to the inner margin, along which it spreads slightly basally; the discal band defined proximally by a line of fuscous scales; wing proximal to the line of same tint as that on distal side of white band, with long brown hairs, these darker basally; apex with a subapical red scaling forming a patch of red with scattered black scales intermixed, the patch posterior to the second branch of the radius; anteriorly the red scaling forming an arcuate line almost to the apex, enclosing inwardly a light pink patch of white, red, and fuscous scales, this patch defined inwardly by a square black spot posterior to the first branch of the radius; posteriorly to the spot a mixture of red and black scaling defining the subapical markings and shading posteriorly into the fuscous of the wing; the center of the ocellus black, ovate, with a narrow clear hyaline space displaced proximally from the center, the center spot enclosed by a narrow ring of light brown scales, this in turn, by a broader ring of black scales bearing on its proximal half a thin crescent of



Calosaturnia albofasciata sp. nov.: Holotype, upper figures, superior surface left, inferior surface right; paratype, lower figures, superior surface left, inferior surface right. (About natural size.)

light blue scales; against the distal side of the ocellus a triangular patch of white, the apex of the triangle outward.

Hindwings; fringes dusky; a broad marginal border of light brown, as in forewing, from outer angle to anal angle, defined inwardly by a wavy, broad, white line; proximal to the line the wing fuscous, as in forewing, extending to the discal white band; from the median vein, concentric to the ocellus proximally, thence directly to anal margin a broad white discal band, somewhat obscured posteriorly by black scaling; base of wing of the same tint as base of the forewing; ocellus slightly smaller than that in forewing, similarly constituted, almost encircled by white scaling.

Inferior surface:

Forewing: similar to upper surface, but white markings less distinct; wing slightly lighter than above and more uniformly dusky gray; light grayish along costal margin and anterior to the medius adjacent to the subapical markings; the discal white band bright proximal to the ocellus, becoming obscured, but visible, posteriorly to inner margin; ocellus as on upper surface, but less bright; the patch of white on the distal side reduced to a small white dot.

Hindwings; markings as of upper surface, but wing anterior to medius and distal to the discal white band much lighter—a light gray shading to somewhat darker against the submarginal white line; discal white band brighter than above, shading into the gray outwardly, defined by fuscous scales proximally; base of wing brownish-gray, with long white and brown hairs; the ocellus with a few blue scales encircling it on the outer black ring.

Holotype: Female; expanse of wings 41 mm.; collected by Mr. W. M. Hooton at Clearlake Highlands, Lake County, California, on October 31, 1934, at noon on a porch screen. Deposited as type No. 4675 in the collection of the California Academy of Sciences at San Francisco by the courtesy of Mr. Hooton.

Paratype: Sex undeterminable; collected in Sequoia National Forest, Tulare County, California, in 1928; month and date unknown; in the collection of Mr. Erich C. Walter, Anaheim, California.

The paratype specimen is somewhat fragmentary, lacking the wing apices, portions of the margins of the hindwings, the antennae, the metathoracic pair of legs, and most of the abdomen. It differs in some slight details from the holotype as follows: the wing measurement at the ends of the first median branches is 51 mm., thus the perfect wing expanse somewhat greater, and considerably greater than the holotype. The wing shape differs slightly from that of the holotype. There is a scattering of pale red scales over both the fore and hindwings on either side of the discal white band and in the black areas of the ocelli on the superior surfaces, giving a very faint pinkish cast to the wings. Aside from these differences, however, the moths are very much alike, having the same body and wing tints and markings on both surfaces.

The species has been described as a member of the genus *Calosaturnia.* The antennae of the female are singly bi-pectinate, as in *Calosaturnia mendocino,* but the anterior pectination which is present as a small spur in *C. mendocino* is completely absent in *C. albofasciata.* The wing venation is that of *Calosaturnia,* having two branches to the radius in the forewings.

For their generosity in loaning the two specimens for study and description, the author wishes to express his thanks and appreciation to Mr. W. M. Hooton, Clearlake Highlands, California, and to Mr. Erich Walter, Anaheim, California, and likewise to Professor E. C. VanDyke, of the University of California, for his advice and assistance.

FURTHER NOTES ON CHABUATA NOTATA, STRECKER AND DESCRIPTION OF A NEW FORM

By Alex K. Wyatt, Chicago, Illinois

This species was described by Herman Strecker in his "LEPIDOPTERA, RHOPALOCERES AND HETEROCERES," Supplement No. 1, page 9, in 1898 (as *Tricholita*). *Chabuata syrissa,* Strecker, was described in Supplement No. 2, page 6, in 1899 (as *Tricholita*). These descriptions are reproduced for convenience.

"*Tricholita notata* n. sp.

> Head, body and primaries brown somewhat of the tint but much darker than in *semiaperta,* and sprinkled sparsely with minute white scales which gives them a somewhat heavy squamose appearance. The t. a. and t. p. lines well defined but not conspicuous, space between these darker than the rest of the wing. A milk white discal spot tinged with yellow on the half towards costa. Fringe same dark color as median space. Secondaries brown but not dark as the primaries.

Expands 1⅔ inches. The single type of this species I received a number of years since from E. A. Dodge, who took it in Nebraska."

"*Tricholita syrissa,* n. sp.

> Head, thorax, and primaries very nearly the same color as *Hydroecia nictitans.* T. a. and t. p. lines indistinct, the space between these is a shade darker than the basal or subterminal areas, terminal space also darker. A conspicuous white ovate reniform crossed in middle by a scarcely noticeable reddish double line. Secondaries brownish with a faint mesial shade, between which and the exterior margin the wing is darkest. Fringe paler.

Expands 1⅛ inches. One example, taken near Chicago, Ill., by Mr. P. Vollbrecht. Without close examination this might easily be mistaken for the variety of *Hydroecia nictitans* having the white reniform."

Both types are in the Strecker Collection now in the Field Museum of Natural History in Chicago. The type of *notata* is a female, that of *syrissa* is a male.

Local captures and discovery and rearing of the larva has brought extended acquaintance with the species and I now have before me a series of fifteen males and thirteen females, almost all bred specimens. The males throughout are of a lighter and more reddish shade than the females, ranging from a reddish salmon color to a purple madder, while the females vary between a Van Dyke brown and sepia. The subterminal area is the brightest and most colorful part of the wing in both male and female, showing at least a tinge of red color in all instances. The terminal area is concolorous or slightly darker than the median area and even where the wings are quite light in color, the fringes are always dark or dusky grey.

The white scales mentioned in Mr. Stecker's description of *notata* are really flat, white tipped scales and are rather densely distributed over the primaries, and the thorax is so closely set with them, that it appears grey when viewed from the front. The discal spot or reniform is white, tinged with yellow on the half toward the costa, just as stated in the original description; however, this yellow often covers more than half of the reniform. It is sometimes crossed by one or two lines of a darker shade, quite generally so in the females.

In some specimens the ordinary lines are quite clearly defined. When this is the case the transverse anterior appears as a series of three arcs, outcurved, the middle one longest, extending in a direct line from costa to inner margin approximately one third the length of the wing from the base. The transverse posterior line appears evenly outcurved beyond the reniform and continues to the inner margin approximately parallel to the outer margin, yet when very clearly defined, this line shows a distinct outward crenulation at the upper angle and shallow arcs bent inward between the veins below this angle.

Antennae are strongly ciliated in both sexes, wider in the male as usual. The cilia taper gracefully to a fine point for the outer one-third of the antennal length.

Expanse of wings; males 1⅛–1¼ inches, females 1¼–1½ inches.

The two names *notata* and *syrissa* are rightly listed as synonyms for they represent the normal female and male of one species.

Among the specimens at hand are four males and two females that have the reniform entirely obscured, showing only as a somewhat lighter patch approximately concolorous with the subterminal area. These specimens bear the same relation to *notata,* that the form *igna,* Barnes & Benjamin, bears to *Chabuata signata,* Wlk. For this form of *notata* I propose the name **"chicagoensis."**

Type locality: Chicago, Illinois.

Types: Holotype male, Chicago, September 6, 1937, in collection of the author; allotype female, Chicago, August 18, 1932, in collection Arthur Herz; paratypes, all from Chicago, September 1, 1904, August 23, 1932, August 25, 1932, and August 28, 1932, in collections Emil Beer and Arthur Herz.

The allotype female has the reniform a shade paler than the subterminal area, but this is the only one of six specimens in which this is the case. In the other female, the reniform appears darker, yet on close examination, a lighter spot in the middle field is apparent. One male paratype has primaries of a uniform reddish salmon color over all.

OCCURRENCE OF LARVAL AND NYMPHAL STAGES OF THE RABBIT TICK, *HAEMAPHYSALIS LEPORIS-PALUSTRIS*, ON WILD BIRDS FROM CAPE COD.[1]

By Carlton M. Herman, Baltimore, Md.

The common rabbit tick, *Haemaphysalis leporis-palustris,* has been reported from a great number of birds. Peters (1936. Bird-Banding *7*: 9–27) records this parasite from 46 species of avian hosts in the eastern part of the United States. He reports 11 of these species to be infested in Massachusetts.

At the Austin Ornithological Research Station at North Eastham, Mass., several thousand ground-feeding birds are banded each year. Peters (1933. Bird-Banding *4*: 68–75) reported *Haemaphysalis leporis-palustris* taken from an Eastern Fox Sparrow (*Passerella i. iliaca*) at the Station, although no routine search for ticks on these birds was ever made. A nymphal stage was also obtained from the ear of a young Song Sparrow (*Melospiza m. melodia*).

During the period from August 26, 1937, to September 7, 1937, a careful search was made of about 250 ground-feeding birds comprising at least 10 species. The results indicate what might be obtained if an extensive search were to be made of a large series of birds over a longer period. All the records reported here are of ticks collected during the above 12-day period.

Ticks were collected from six species of birds as follows:

---

[1] From the Austin Ornithological Research Station (Contribution No. 33) and from the Department of Protozoology, Johns Hopkins University School of Hygiene and Public Health.

(1) Eastern Bob-white (*Colinus v. virginianus*)
2 larvae, 1 nymph
(1) Catbird (*Dumetella carolinensis*)
2 larvae
(1) Red-eyed Towhee (*Pipilo e. erythrophthalmus*)
28 larvae, 1 nymph
(1) Eastern Vesper Sparrow (*Poœcetes g. gramineus*)
10 larvae
(1) Eastern Chipping Sparrow (*Spizella p. passerina*)
1 larva
(18) Eastern Song Sparrow (*Melospiza m. melodia*)
95 larvae, 3 nymphs.

The Vesper Sparrow (*Poœcetes g. gramineus*) is the only new host record reported in this paper, and all but the towhee and chipping sparrow have been previously reported to be infested in Massachusetts.

Most of the parasites were collected from the top of the head, a few were attached about the eyes and ears. No ticks were collected from other parts of the body. A total of 134 larvae and 6 nymphs were collected. The greatest number of ticks obtained from a single bird was 29 specimens from a young towhee. With the exception of the song sparrows only young birds were parasitized. Six of the song sparrows were adult birds, the other 12 were young. The average number of ticks on each song sparrow was 5; seven sparrows had only one tick; four of the birds had 3 ticks each; and one sparrow was infested with at least 18 ticks. During the period from August 26 to September 7, 1937, when all of these ticks were collected, 31 song sparrows were carefully examined for ticks. *Haemaphysalis leporis-palustris* was obtained from 18 of these birds, or at least 58 per cent.

The occurrence of such a large number of the early stages of this tick on some of these small birds suggests that these are natural rather than accidental hosts for this parasite. The large percentage of song sparrows infested seems to indicate that the bird serves as a common host for the early stages of *H. leporis-palustris*. Dr. J. Bequaert, of the Harvard Medical School, informs me that the adult stages of this tick are common on the wild rabbits on Cape Cod. In view of the rôle this tick may play in the spread of tularemia and spotted fever, it will be necessary to consider the infestations of ground-feeding birds in any effective measures to control this species of tick.

The author is indebted to Dr. Bequaert for verifying the diagnosis of the ticks reported above.

BIOLOGICAL NOTES ON CHABUATA, STRECKER

By Arthur Herz, Chicago, Illinois

In August, 1831, a noctuid unknown to me emerged in one of my breeding cages. It was later identified as *Chabuata notata* by Mr. Alex K. Wyatt. I could not give a correct answer to his question about its origin, but could only guess that the pupa had been carried in with some *Papaipema* material dug up in the prairies northwest of the city.

The following year luck was with me when collecting about the same locality on the afternoon of May twenty-second. My attention was centered upon the various plants of the prairie, which at this time of year in their early growth, are more or less of a botanical puzzle. Certain bunches of leaves were an outstanding feature of the field by their abundance and their clustered patches. The plant was later identified as the Stiff or Hard Leaved Golden-rod (*Solidago rigida*). What was more interesting at the time; there was considerable evidence of larval feeding on these leaves, so much that I decided I must find the culprits. No larva was to be found on the leaves. On the ground around the base of the plants and nearby was a variety of litter, mostly dried leaves of poplar, Prairie Dock and of the golden-rod itself, some attached to pieces of last year's stems. Every bit was turned and examined and it was not long before the first larva was found. It was concealed in a bit of old golden-rod leaf, rolled and formed into a snug fitting case or house fastened together with silk. After this first find it became easier to recognize the hidden treasure by sight and feeling, the weight of the nearly mature larva easily distinguishing a full house from an empty leaf. Not knowing the identity of my find, I continued the search and gathered about twenty-five of these larvae. They were of typical noctuid character, grey with a reddish brown tint and velvety skin. No distinctive features were noticeable and it will take a more skilled observer to write a thorough description.

The rearing of the larvae offered no difficulty; they finished feeding about June 10 and pupation took place promptly on or under the surface of soil, particles of which were mixed with silk in the construction of a loose cocoon.

A thrill of surprise and pleasure was enjoyed when the first moth appeared on August 10 and the identity of the species was revealed as *Chabuata notata*. A total of eighteen moths was obtained, the last one emerging on September 4. Four of the moths showed a distinct variation from normal in the absence of the cream colored spot in the reniform. A few larvae had been parasitized and a number of small red Ichneumons were noticed but not recorded. Emergence of the moths occurred in the late afternoon.

This larva has since been collected repeatedly and is apparently well distributed wherever this golden-rod is frequent. Last year (1937) Mr. Wyatt and I found a few *notata* larvae which had been feeding on the Prairie Dock (*Silphium terrebinthinaceum*) and new growth of this plant was accepted as food by captive larvae. A number of larvae were picked from the folds of dry leaves of this plant, which afford an ideal shelter for them, though they may have been feeding on the golden-rod.

It is apparent that prairie fires in fall or early spring will destroy sheltering possibilities for the larvae and often the larvae themselves. In localities thus deprived, the collector will have poor success. It has not yet been determined whether hibernation of *notata* takes place in the egg or the early larval stage, but until proof is ascertained by observation, it may be assumed that the latter is true, as is the case with *Chabuata signata*.

THE IDENTITY OF *TABANUS MOERENS* FABR.

L. L. Pechuman, Ithaca, N. Y.

Philip (1931. U. Minn. Tech. Bul. 80, p. 82) was the first to call attention to the existence of *Tabanus moerens* Fabr., referring to a description published by Fabricius in 1794. On a basis of this description alone, Philip decided that Fabricius' *moerens* was a *Chrysops* and the later *Chrysops moerens* of Walker (1848. List. Dipt. Brit. Mus., Pt. 1, p. 201) must necessarily fall; *Chrysops aestuans* v. d. Wulp (1867. Tijd. v. Ent. *10,* p. 135), a synonym of *C. moerens* Walk., thus became the valid name for Walker's species. Brennan (1935. U. Kan. Sci. Bul. *22,* No. 13, p. 261) followed Philip's interpretation.

However, by correspondence with a number of European and American workers, the writer found that Philip's interpretation was not generally accepted since the identity of *Tabanus moerens* was completely unknown; one worker, apparently without any attempt to verify Philip's reference, went as far as to say that such an insect did not exist. It is true that as far as the literature on Tabanidae is concerned, *Tabanus moerens* had no existence. It is not listed in Kertesz's "Catalogus Dipterorum" (1908), in

Kröber's catalog of the Neotropical species (1934. Rev. Ent. *4*), or, as far as the writer can determine, in any other publication dealing with Diptera. It is mentioned, however, by Sherborn (1928. Index Animalium, Sec. 2, Pt. 15, p. 3817).

The remarkable absence of references to this insect in the literature is further emphasized when it is realized that there are three conspicuous references to it in Fabricius' own works. The species was originally described from Cayenne in "Mantissa Insectorum" (1787. Vol. 2, p. 356) and the description repeated almost word for word in "Entomologia Systematica" (1794. Vol. 4, p. 372). The description is fairly long and clear enough so that a rather accurate guess can be made as to the identity of the species. Fabricius also called attention to its similarity to *Tabanus caecutiens.* When the genus *Chrysops* was established by Meigen in 1803 (Illig. Mag. *2,* p. 267), *Tabanus caecutiens* became the genotype. Two years later Fabricius in "Systema Antliatorum" (1805. p. 111) accepted Meigen's genus *Chrysops,* further characterized it, and listed *Tabanus moerens* and twelve other species as included within its limits; all but one of these twelve species are still regarded as *Chrysops* by modern workers.

The writer was inclined to regard the above as good evidence that *Tabanus moerens* was a *Chrysops* and, on a basis of description alone, probably the same as *Chrysops variegata* (de Geer). After some difficulty the type, of which only a single wing remains, was located at the Zoological Museum of the University of Kiel. The writer sent a representative collection of northern South American species of *Chrysops* to Dr. Olaw Schröder but did not indicate his suspicions as to the identity of *T. moerens.* Dr. Schröder kindly compared the type wing with the specimens and reported that it was identical with the wings of the *Chrysops variegata* specimens included in the lot of material. The wing of *C. variegata* is quite characteristic and in the writer's opinion this is sufficient evidence to include *Tabanus moerens* Fabr. as one of the several synonyms of *Chrysops variegata* (de Geer). *Chrysops moerens* Walker must therefore be replaced by *Chrysops aestuans* v. d. Wulp.

NEW CHECK LIST OF MACROLEPIDOPTERA.

By John A. Comstock, Los Angeles, Calif.

The Southern California Academy of Sciences has announced a forthcoming publication that will be of considerable interest to Lepidopterists. Particularly is this the case with those who have endeavored unsuccessfully to obtain copies of the rare Barnes & McDunnough Check List of N. American Lepidoptera, or the Barnes and Benjamin Check List of Diurnal Lepidoptera, both of which have been long out of print.

The announcement is to the effect that a new "Check List of the Macrolepidoptera of Canada and the United States of America," by Dr. J. McDunnough is now in print, and is soon to be issued as Volume One of a new series of "Memoirs" of the Southern Calif. Academy of Sciences. It will be printed on a durable offset book paper that will take ink without blotting.

The page size of the List is 7 by 10 inches, which gives a wide margin around the type material.

In addition to the regular issue it is planned to print two special editions, provided sufficient advance interest is evidenced by specialists.

The first of these will be an issue, printed on only one side of the page, so that every other page may be used for additions and notes. The second proposed special printing will be run on white cardboard, without an index. It will be designed for use as labels.

Dr. McDunnough has brought this list down to the end of 1937, incorporating all species described since the last Barnes and McDunnough List, exclusive of the families which follow the Geometrids. The new list is completely revised to incorporate the large amount of published material that has been issued by the several specialists so far as it relates to systematic relationships. The author's eminent standing as a systematist insures a work that will be indispensable to all Lepidopterists.

Further details regarding the above may be obtained by writing Dr. John A. Comstock, Treas., So. Calif. Academy of Sciences, c/o Los Angeles Museum, Exposition Park, Los Angeles, Calif.

NOTE: Title page and index for Entomologica Americana, vol. 17, are bound in with no. 4.

PROCEEDINGS OF THE SOCIETY.

Meeting of December 16, 1937.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, December 16, 1937. The meeting was called to order at 8:15 P. M. by President William T. Davis. Nine other members were present, namely, Dr. Dietrich and Messrs. Buchholz, Dietz, Engelhardt, McElvare, Nicolay, Sheridan, Siepmann and Stecher.

The minutes of the previous meeting were read and approved. Mr. Engelhardt, reporting as Treasurer, said that the society was in excellent financial condition, and that outstanding obligations were being met.

Mr. Davis appointed a Nominating Committee, to consist of Messrs. John M. Sheridan, Henry J. Dietz, and Hans L. Stecher.

Dr. Dietrich proposed for membership Mr. Karl V. Krombein, 22 Meadow View Place, Buffalo, New York. The matter of his election will be taken up at the next meeting.

Mr. McElvare reported that Mr. Engelhardt had taken 24 fine specimens of the Noctuid moth, *Melicleptria villosa,* at Trout Lake, in the San Juan Mountains, near Telluride, Colorado.

Mr. Dietz showed three pairs of moths from Anaheim and Orange, California, all supposed to be *Gloveria gargamela.* However, the males differ, and are probably not the same species. In those which are typical *gargamela,* the forewings are convex, and in the other the forewings are concave. They also differ in other respects.

Mr. Davis exhibited specimens of the mutillid, *Dasymutilla occidentalis.* This species occurs on but one small area on Staten Island, a sandy area at Fort Wadsworth, near the Narrows. Notwithstanding that there are many sandy tracts throughout Staten Island, this species has not been recorded elsewhere on the island.

Mr. Nicolay spoke on the subject of his collecting trip to Mt. Katahdin, Maine, last July, supplementing his talk with photographs and specimens collected there. The country around Mt. Katahdin is, on the whole, very disappointing, especially when compared with the White Mountains. It is a rather barren and desolate region until you get to the very base of Katahdin. The mountain is now owned by the State of Maine, and it is expected that henceforth its natural forest growth will be better cared for than it has been in the past.

Compared with Mt. Washington and the White Mountains, there is a great scarcity of Carabidae on Mt. Katahdin. There are few stones to turn over, and few other likely places to look for them. Beetle traps were most unprofitable. From eighteen bottles only three specimens of *Cychrini* and six or seven other specimens were obtained. Three specimens of *Sphaeroderus nitidicollis* var. *brevoorti* were taken on the slopes of Mt. Katahdin. Other Carabidae taken included *Sphaeroderus lecontei* var. *diffractus, Sphaeroderus canadensis,* and *Lyperopherus punctatissimus.*

A series of the Katahdin butterfly, *Oeneis katahdin,* which occurs here, and nowhere else in the world, was taken. This butterfly occurs on the summit of the mountain, and comes out only when the sun shines. As soon as it becomes cloudy, it disappears. One can not get them by flushing them up, either, as they hide in the crevices of the rocks. Asked whether there was much danger of this butterfly becoming exterminated, as Katahdin becomes more accessible to the public, Mr. Nicolay replied that he didn't think this very likely. The average person who visits such places doesn't go far off the trail, and the few people interested in those things are not enough to exterminate the species. While the flat plateau on which it occurs is a very restricted area, the butterfly undoubtedly also occurs on the steeper and less accessible peaks of Katahdin.

The common *Colias* is *Colias interior;* only two specimens of *philodice* were seen.

Other lepidoptera taken on or near Mt. Katahdin by Mr. Nicolay include: *Feniseca tarquinius, Satyrodes canthus, Pieris napi cruciferarum, Polygonia gracilis, Polygonia progne,* and *Polygonia faunus.*

The meeting adjourned at 10:05 P. M.

CARL GEO. SIEPMANN,
Secretary.

MEETING OF JANUARY 13, 1938.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, January 13, 1938. The meeting was called to order at 8:20 P. M. by President William T. Davis. Nine other members were present, as follows: Dr. Dietrich, Messrs. Dietz, Engelhardt, McElvare, Rau, Sheridan, Shoemaker, Siepmann and Stecher. Four visitors were present, namely, Miss Dietz, and Messrs. Henry Bird, John Elfstrom, and Richard Fisco.

The minutes of the previous meeting were read and approved.

Mr. Engelhardt submitted the annual report of the Treasurer, showing receipts of $3103.15 (including $327.20 Balance carried over from 1936); disbursements of $2423.50, and a balance in the drawing account of $679.65. The report was received with thanks.

The Report of the Publication Committee for 1937 was read by Mr. Engelhardt.

The matter of the election of Mr. Karl V. Krombein was next taken up. He was duly elected a member.

Mr. Dietz, reporting for the Nominating Committee, proposed that the present officers remain in office, namely:

President—William T. Davis
Vice President—Jose R. de la Torre-Bueno
Treasurer—George P. Engelhardt
Recording Secretary—Carl George Siepmann
Corresponding Secretary—Frederick Lemmer
Librarian—Herbert Wilford
Curator—John M. Sheridan
Delegate to the New York Academy of Sciences—George P. Engelhardt.

There were no other nominations, and the officers proposed were unanimously elected.

Mr. McElvare reported that the Noctuid Moth, *Schinia balba brucei,* was taken at Colorado Springs, Colorado, last summer by Mr. Engelhardt.

Mr. Engelhardt showed some specimens of clearwing moths taken by Mr. Rummel. Included was a specimen of a new species being described by Mr. Engelhardt, the first specimen of that species to be recorded from New Jersey. Mr. Engelhardt said that the species has never been bred, and he was desirous of finding out what the food plant is. He thinks that it might be a borer in wood, perhaps in sour gum, but has no evidence to support this idea.

Mr. William T. Davis showed a male and four females of the walking stick insect *Diapheromera femorata* Say, collected at Orient, Long Island, by Mr. Roy Latham in August, 1937. The insect has been found in several other localities in Suffolk County, but has not been reported from the western part of the Island. *Manomera atlantica* Davis is more generally distributed on Long Island, and although reported from Massachusetts to Virginia along the coast, females only have been found. In the allied *M. blatchleyi* of Indiana and Illinois, in which the legs are shorter and the head differently shaped, males have been found.

Mr. Davis also reported that Roy Latham obtained a specimen of the seventeen year locust at Babylon, Long Island, in 1937, and heard another one singing. Brood X occurred at Babylon in numbers in 1936, and Mr. Davis suggested that the specimen may have been a belated specimen of Brood X that required 18 years for development instead of the usual seventeen.

Mr. McElvare spoke on the subject of "Collecting Noctuid Moths, *Heliothinae,* on the Carolina Seaboard," illustrating his talk with specimens arranged according to the localities in which they were collected. His paper will be published separately in the BULLETIN.

Mr. McElvare reported that after relaxing and mounting his *Heliothinae* in the usual fashion, about half of them settled. As a rule, when mounting moths, a few specimens are troublesome, but here he consistently had trouble. Mr. Shoemaker recommended putting a little gum tragacanth at the base of the thorax. Mr. Engelhardt said that after the specimen is moistened, and the wings are put up, it is possible to break the wing muscle, and the wings will then dry straight.

The meeting adjourned at 10: 15 P. M.

CARL GEO. SIEPMANN,
Secretary.

MEETING OF FEBRUARY 10, 1938.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, February 10, 1938. President William T. Davis presided, and nine other members were present, as follows: Dr. Dietrich, Messrs. Bird, Buchholz, Dietz, Engelhardt, McElvare, Rau, Siepmann and Stecher. One visitor was present, Mr. John Elfstrom.

The minutes of the previous meeting were read and approved. Mr. Engelhardt submitted a Treasurer's report from January 1 to February 10, showing an income account of $1516.50, and disbursements of $853.59. Mr. Engelhardt also reported that sales of the Glossary were proceeding favorably, and that the society was liquidating the obligations incurred in connection with it.

Mr. Engelhardt read brief notes from Mr. Howard Notman, who is staying in Arizona and California, and from Mr. William T. Bather, who is in Jamaica, West Indies.

Mr. William T. Davis showed a brightly colored specimen of the large Cicada, *Tibicen flammata* Distant, from Japan, and the smaller but closely allied species, *Tibicen bihamata* Motschulsky, from the same country. The venation, colors and other characters of Cicadas from widely separated parts of the world are often surprisingly similar, and four recently collected specimens of *Tibicen paralleloides* Davis from the west coast of Mexico were shown by way of illustrating the fact.

Mr. Henry Bird spoke on the subject of the Fig Insect, *Blastophaga.* He said that most people think of insects as wholly harmful and unpleasant, without realizing that many species are of great benefit to man. Among such beneficial insects is the Fig Wasp. Its rôle in the cross-pollination of the Smyrna Fig has been known since antiquity, and the literature on it is now quite extensive, but the process is by no means generally understood, and the average person has perhaps never even heard of it.

When Smyrna figs were first grown in California, the trees thrived, but the crop of fruit failed to mature. Mr. E. A. Schwartz was sent from Washington to study the situation, and as a result of his investigation, caprification can now be generally employed in the Californian fig orchards.

The Smyrna fig has no staminate flowers. In order to secure a satisfactory crop of fruit, pollination must take place. The wild caprifig, which possesses staminate flowers, must be grown. This alone, however, is not sufficient to effect pollination as the flowers of the Smyrna fig are inside the fruit, and can not be reached by ordinary insects. Pollination is accomplished by a minute hymenopterous insect of the genus *Blastophaga,* which breeds in the caprifig. This wasp can enter the Smyrna fig and pollinate the flower, but the flowers are so formed that the wasp can not oviposit therein. Consequently larvae do not develop in the Symrna fig.

Commercially, caprification is accomplished by hanging branches of the caprifig about the fig orchard in little wire baskets or other containers. At just the right time, the *Blastophaga* emerge from the caprifig and pollinate the flowers.

In March, 1935, Mr. Bird was in Florida, assisting in some experiments to determine which insects were eaten by birds and which were rejected. In the course of these experiments, he noticed some small insects breeding in the fruit of one of the two species of wild fig that grow in southern Florida. He bred these out, and obtained a species of Diptera, and eight species of Hymenoptera. Included among them were a *Blastophaga,* presumably an undescribed species, differing from the one which was introduced into Southern California. The insects which breed inside these figs present a complex biological problem. Mr. Bird said only a few foreign specialists have had experience with a similar fig-inhabiting complex.

Mr. Bird exhibited specimens of the fig insects he obtained in Florida, and drawings of the *Blastophaga.*

The meeting adjourned at 10:00 P. M.

CARL GEO. SIEPMANN,
Secretary.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

BUY OR EXCHANGE: Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, College of the City of New York, New York City.

EXCHANGE OR FOR SALE.—*Catocala herodias* (Gerhardi), *Graptolitha viridipallens* and others. Wanted: Rare N. A. Macro-Lepidoptera. F. Lemmer, Lakehurst, N. J.

WANTED.—North American CHRYSIDIDAE for exchange or determination, with privilege of retaining duplicates. W. G. Bodenstein, Dept. Entomology, Cornell University, Ithaca, New York.

PENTATOMIDAE: Want to buy or exchange Petatomidae from the United States and Mexico. Herbert Ruckes, College of the City of New York, 17 Lexington Ave. N.Y.C.

LOCALITY LABELS—5 in strip, 1 to 3 lines. 75c per thousand. Pamphlet price list, samples upon request. Any size type. 3½ point, $1.00 per thousand. George F. Michels, Printing—604 Hollenbeck St., Rochester, N. Y.

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J. R. de la TORRE-BUENO, Editor
CARL GEO. SIEPMANN GEO. P. ENGELHARDT

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The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXXIII October, 1938 No. 4

A REVISION OF THE GENUS MICRORHOPALA IN NORTH AMERICA, NORTH OF MEXICO.

By Robert Henry McCauley, Jr.,
Cornell University, Ithaca, N. Y.

History of the Genus.

The generic name *Microrhopala* Chevrolat first appeared in Dejean's Catalogue of 1837* with four species listed under it. Of these *gagatina* Dej. is a nomen nudum, and two of the remainder were North American species: *Hispa vittata* Fab., and *H. excavata* Oliv.

In 1838, Newman described *Hispa xerene,* and in 1841 he described *Hispa erebus.* In 1853, Melsheimer in his "Catalogue of the Described Coleoptera of the United States" gave Chevrolat as author of the genus *Microrhopala* and placed within it *Hispa vittata* Fab., *M. porcata* Mels., *H. excavata* Oliv., *H. collaris* Say (later placed in *Odontota*), and *H. cyanea* Say, described in 1823. He retained the old genus *Hispa* and left in it *xerene* Newm. and *erebus* Newm. along with six other species. In 1859 Leconte described *laetula* in *Microrhopala.*

It remained for Baly in 1864 to write the first generic description of *Microrhopala,* and to designate *vittata* as the type species.

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* There has been some doubt as to the exact date of the first appearance of the name *Microrhopala.* I use the date 1837 at the recommendation of Mr. H. S. Barber, from whose correspondence I quote the following in regard to the Dejean catalogues: ". . . the so-called 'editions,' and the title-page dates are not reliable and have led to many errors in the dating of names. I have examined copies with 4 or 5 title-page dates ranging from 1833 to 1837 but the earliest correct date for *Microrhopala* is 1837 in spite of the fact that it may be found in copies of the catalogue with title-pages bearing the prior dates."

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He placed in *Microrhopala* the following four North American species and these are still recognized in the genus: *M. vittata* (Fab.), *M. excavata* (Oliv.), *H. xerene* Newm., and *M. bivitticollis* which he described as new, but which is in reality synonymous with *M. signaticollis* of Leconte, 1859, later a variety of *rubrolineata* (Mann.).

In 1873 Crotch described *melsheimeri* and included in the genus seven other species. *M. vittata* (Fab.), *M. xerene* (Newm.), *Odontota rubrolineata* Mann., *M. cyanea* (Say), *M. excavata* (Oliv.), *M. porcata* Mels., *Hispa plicatula* Fab. In his check list of the same year he listed these and included also varieties *laetula* Lec., *interrupta* Coup. and *signaticollis* Lec.

Chapuis in 1875 in his "Genera des Coléoptères" reaffirmed the designation of *vittata* (Fab.) as type by Baly and accredited the genus to Chevrolat. Another species, *floridana,* was added by Schwarz in 1878 and recognized by Horn in 1883, who at this time also described *dimidiata, vulnerata* and *montana.* He included also in the genus: *vittata* (Fab.), *xerene* (Newm.), *rubrolineata* (Mann.), *erebus* (Newm.), *excavata* (Oliv.), *cyanea* (Say), *porcata* Mels., and *melsheimeri* Crotch, and like Chapuis refers *Microrhopala* to Chevrolat. Horn, furthermore, took *plicatula* (Fab.) out of the genus and placed it in *Octotoma.*

J. B. Smith described *uniformis* in the genus in 1885, which species was recognized by Henshaw in his "List of Coleoptera of North America." He referred the genus to Baly and placed in it 13 species: *vittata* (Fab.), *dimidiata* Horn, *xerene* (Newm.), *rubrolineata* (Mann.), *vulnerata* Horn, *floridana* Schwarz, *erebus* (Newm.), *excavata* (Oliv.), *cyanea* (Say), *uniformis* Smith, *porcata* Mels., *montana* Horn, and *melsheimeri* Cr. Of these, four are not at present assigned to the genus, and another has dropped to subspecific rank. However Donckier de Donceel in his "Catalogue des Hispides," included all these American species and added to the list *bivitticollis* of Baly, although he recognized *signaticollis* (Mann.), and *laetula* Lec. as a variety of *vittata* (Fab.). He did not recognize that *bivitticollis* Baly was identical with *signaticollis* Lec.

In 1905 Weise removed *montana* Horn from the genus and placed it in *Brachycoryna.* He also took *melsheimeri* Cr. from *Microrhopala,* and renamed it *Brachycoryna horni.* He removed *M. dimidiata* Horn (1883) from the genus and synonymized it with *Pentispa melaneura* Chapman (1877). Weise placed in the genus, *Pentispa suturalis* Baly (1885). In 1906 Schaeffer described *M. arizonica.* In 1911 Weise synonymized this with *M. suturalis*

(Baly) which he returned to its original genus, *Pentispa.* Previous to this, in 1907, Weise relegated *M. porcata* Mels. to the genus *Uroplata.*

Microrhopala received no more attention taxonomically until 1925 when Van Dyke described a new variety of *rubrolineata, militaris,* from California. Since this date, no taxonomic work has been done on the genus.

In this paper the generic name *Microrhopala* is referred to Dejean who published it for the first time in his "Catalogue des Coléoptères" in 1837. He included in the genus, which he referred to Chevrolat, four species indicating his conception of it. Chevrolat did not publish the name *Microrhopala* in any connection. Consequently the name must be referred to Dejean.

Description of the Genus.

Head small, rounded, free from prothorax; vertex marked with three longitudinal grooves of which the middle one is straightest and best defined, lateral grooves sometimes more or less irregularly broken into longitudinal punctures; sutural line between front and clypeus more or less raised, forming a transverse carina; labrum rather large, transverse, truncated; maxillary palpi short, last joint pointed and long as the preceding two together; eyes not prominent, oval, encircled by fine punctures which continue to sides of buccal orifice; antennae short, about as long as head and thorax together, somewhat club shaped; first segment rather large; second to sixth slightly obconical and nearly equal in diameter; seventh abruptly swollen, larger; eighth to eleventh inclusive united into an oval mass, with only slight indications of segmental divisions; eleventh segment somewhat flattened apically at a vertical, oblique angle, and abruptly produced to a point.

Prothorax broadly transverse, anterior edge straight or very gently arcuate, posterior edge subsinuate on each side, angles subacute, lateral edges arcuate to nearly straight and usually slightly explanate; anterior lateral angles usually slightly produced, each bearing a single curved setiferous hair; dorsal surface convex, more or less densely and deeply punctured; scutellum transverse, nearly rectangular, slightly arcuate behind.

Lateral edges of elytra slightly divergent and uniformly rounded apically; eight rows of punctures always arranged longitudinally in four pairs of rows; punctures sometimes more or less confluent and confused, intervals regular, may or may not be raised, never have more than two punctures between them; humeri prominent or not, edges explanate, serrate or not; medial edges raised at slight angle causing medial row of punctures to appear impressed; prosternum somewhat furrowed in middle, widened and rounded at base; femora straight or nearly so, larger at middle and apically; fore and hind tibiae gradually enlarged apically; middle tibia slightly curved, brushlike hairs at inside of apex; first joint of tarsus small, fourth joint rather long, exceeding by a third the lobes of the preceding, armed with divergent claws, which are separated by a so-called subungual plate.

Abdomen with five segments.

The sexes differ externally only in size, the male being somewhat smaller.

The genitalia of *Microrhopala* in common with other genera of the subfamily *Hispinae* are of little taxonomic value. During the winter of 1935–36 the male genital tubes of a large series of individuals from all the species in the genus were carefully dissected out and mounted upon hairs. The results were very disappointing. At first, slight differences seemed to be apparent between species, but as the series were extended it was soon obvious that these differences were no greater than the differences existing between members of what were unquestionably the same species. In no instance was a character observed which was either constant, distinct, or describable enough to be used taxonomically. The female genitalia showed even less and in addition are difficult to preserve in a position undistorted as well as practical for observation.

KEY TO SPECIES AND VARIETIES OF MICRORHOPALA.

1. Dorsal surface unicolorous 2
   Dorsal surface of more than one color 6
2. Only the interval between the 6th and 7th rows of punctures raised 3
   Intervals between 6th and 7th rows and between 4th and 5th rows of punctures each raised, or by reason of very large coarse punctures striae irregular or obscure 4
3. Elytral serrations strong and distinct.
   Abnormal specimens of *M. excavata*
   Elytral serrations absent or weak and indistinct ... *M. cyanea*
4. Elytral humeri not prominent, prothorax nearly as wide as humeri, in proportion as 5 : 6, sides of pronotum nearly straight, subparallel .... *M. floridana*

Elytral humeri prominent, prothorax more distinctly narrower than humeri, less in proportion than 5:6, sides of pronotum convex or angled, strongly divergent at base 5

5. Punctures large, deep, contiguous, rows irregular, surface very coarsely sculptured, sides of pronotum convex only slight suggestion of angle; specimens from extreme Southeast. *M. erebus*

Punctures not contiguous, rows not very irregular, surface not coarsely sculptured, sides of pronotum with distinct median angle, specimens from Gulf, Central, or Atlantic states .... *M. excavata*

6. Edges of elytra not serrate .... *vittata*

Edges of elytra serrate 7

7. Ventral surface metallic blue 8

Ventral surface black 11

8. Elytra without markings ..... *rubrolineata* var. *signaticollis*

Elytra with markings 9

9. Vittae narrow, between fourth and fifth rows of punctures. *rubrolineata*

Vittae wider, not bounded by fourth and fifth rows of punctures 10

10. Vittae narrower posteriorly becoming obsolete at posterior third .... *rubrolineata* var. *vulnerata*

Vittae truncate before middle, obsolete posteriorly. *rubrolineata* var. *militaris*

11. Elytral vittae normal, entire .... *xerene*

Elytral vittae interrupted for a short distance posterior to the middle .... *xerene* var. *interrupta*

Microrhopala vittata (Fab.).

1798 *Hispa vittata* Fabricius, Suppl. Ent. Syst., p. 117.
1837 *Microrhopala vittata* Dejean, Cat. Coléoptères, p. 389.
1859 *Microrhopala laetula* Leconte, Col. Kans., Smithsonian Contribution to Knowledge, 2: 27–28.
1864 *Microrhopala vittata* Baly, Ann. Mag. Nat. Hist. 14: 268–269.

Description.

Length 5.5 mm–7.5 mm.

General outline elongate oval, divergent posteriorly. Genae coarsely punctate below eyes; median longitudinal carina on vertex between antennae; color mostly yellowish red, darker, often black, between eyes and around buccal orifice.

Lateral edges of pronotum variable, nearly straight or evenly curved to obtusely angulate; dorsal surface coarsely, shallowly, but not densely punctate, usually with single incomplete median longitudinal groove; color in life decidedly red; dried specimens much duller, variable, light yellowish red to reddish brown; anterior and lateral edges dark brown or black, especially in eastern material, sometimes a variable, dark, median longitudinal band.

Elytral humeri not prominent; dorsal punctures more or less elongate, more elongate in medial row; interval between fourth and fifth rows of punctures more or less raised, interval between sixth and seventh less raised; edges of elytra never dentate, very slightly foliaceous; color in life black, vittae red, like pronotum; dried specimens brown to nearly black, interval (vittae) between fourth and fifth puncture rows, and outer edges of elytra, yellowish red; some specimens somewhat metallic, with bluish or greenish reflections.

The variety *laetula* described from Fort Riley by Leconte in his "Coleoptera of Kansas," 1859, as a new species is of interest in that no specimen examined by the writer agrees in all respects with the original description. Individuals do occur, not uncommonly, which agree perfectly in color of head and thorax with Leconte's description. Such specimens are however not confined to the West nor to any determinable locality as habitat. The thorax of *vittata* only rarely has straight edges, and in such casts there seems to be no corresponding relation to color. According to the original description of var. *laetula* the vittae are abbreviated, a condition occurring in only a very few specimens where again the other color characters and the edges of the thorax are quite variable alone and in relation to each other. The abbreviated vittae themselves are of two types: the entire interval between the fourth and fifth rows of punctures may be raised, (only the color fading out posteriorly, or the interval may be raised) only as far as it is colored, usually one third to one half the length of the elytra. Two specimens of *"laetula"* are therefore seldom alike. In view of the fact that *"laetula"* even as a variety is a form so difficult to delimit structurally, geographically and even as to color it seems that it should be treated as a mere aberration of *vittata*.

The writer has seen one specimen from Colorado Springs, Colorado, now in the U. S. National Museum Collection, which has neither any indication of vittae nor raised intervals. The elytral punctures in this specimen are small, shallow and elongate, resembling the punctures nearest the elytral suture in normal specimens.

The sides of the pronotum are straight and slightly divergent. The dorsal punctures are rather sparse and appear less deep than in the average specimen of *vittata*. The head is black except for a dull rufus occipital spot on either side. Horn, Trans. Amer. Ent. Soc. Philad. 1883 describes such a specimen as a variety of *vittata* but gives it no name: "A specimen from Colorado has the elytra entirely black, without vitta, the head is also fuscous." It is reasonable to assume that such a specimen is a rare aberration of *vittata*. Other specimens from Colorado Springs show no deviations from the normal *vittata*. To the inexperienced eye, this specimen without vittae appears to deserve the status of a new species. A closer examination however reveals the form and general configuration of *vittata*. Those specimens having abbreviated vittae in conjunction with abbreviated raised intervals are obviously intermediate forms. The elytral configuration posterior to the short vittae and intervals corresponds exactly with the entire dorsal configuration of the specimen having no vittae.

The exact shape of the lateral edges of the pronotum is quite variable throughout the species. This is also true to a lesser extent of the number and coarseness of the dorsal pronotal punctures. It is not difficult to conceive such an aberration occurring in so variable a species.

Description of Larva

General form grublike, subcylindrical, tapering posteriorly.

Head heavily chitinized, set deeply into prothorax; front separated from two posteriorly projecting lobes of occiput by anteriorly divergent laterally oblique sutures; clypeus fused to front; labrum transverse, nearly rectangular, shallowly and widely emarginate at middle; mandible projecting slightly beyond labrum, sturdy, tridentate, middle tooth largest; maxilla broad, blunt, lacinia with long slender teeth, in close approximation to galea, two segmented maxillary palpi lateral to these; labium transversely oval, straight posteriorly, no palpi; gula wide longitudinally rectangular; postgenae lateral to gula, longitudinal, wider behind; three ocelli on each side of head, triangularly placed immediately laterad of the frontal sutures; antennae three segmented, mediad to the sutures.

Thorax not chitinized, except transversely oval dorsal patch, and ventral patch wider in front, truncate behind, constricted somewhat past middle, on prothoracic segment; legs present on all segments; coxae, femora, tibiae present, tarsi very short, single claw between two fleshy divergent lobes; mesothoracic segment with spiracles.

Abdomen seven of nine segments extending laterally in nipple like projections surmounted by a small blunt chitinized tip which turns somewhat posteriorly; spiracles present in all but last segments.

Description of Pupa

General appearance slightly shorter than last larval instar, more oval in outline, less depressed; color white at first, changing to brown.

Head concave anteriorly, wide in proportion to first thoracic segment; antennae bent downward and sideward to place at side ventrad to humeri.

Prothorax wide, smooth, set dorsally with four bristles arranged as a symmetrical trapezoid, narrower posteriorly, within a larger rectangle, two bristles on each side lateral to anterior corners of rectangle, three bristles at lateral edges, in longitudinal row just above posteriorly bent antennae, each bristle set in a small tuberosity; meso- and metathorax shorter, wider, each slightly produced posteriorly; wings appressed at sides, bent ventrad, thrust between mesothoracic and metathoracic legs, reaching just past posterior edge of third ventral segment, striations visible.

Abdomen with lateral tubercles reduced, each with three spines, spiracle 1–5 distinct, spiracles 6–7 faint; dorsally 6 spines on each segment, each set in tubercle, one on each side, and two pairs mediad, arranged as a symmetrical trapezoid, narrower posteriorly, anal segment with only four spines, transverse rows of eight each set on tubercles, medial six in pairs; lateral spines in segment 7 modified to shorter spike-shaped tuberosities; anal segment, spines surround anus, six hooks present, one on each side of two beneath, and two above anus.

Distribution

Vittata is the most widely distributed of the species of *Microrhopala.* The most numerous records are in the East which has been more closely collected than other regions. It probably occurs in every state, with the possible exception of Arizona and New Mexico, and in the southern provinces of Canada from east to west.

Type Locality: "Carolina."

Locality Records

Maine: Old Orchard; Wells Beach. *New Hampshire:* Ossipee; Rye. *Massachusetts:* Beverly; Brookline; Cohasset; Faneuil Station; Lynn Beach; Marion; Nahant; Needham; Sherborn; Tewksbury; Tyngsboro; Winthrop Beach; Woods Hole. *Connecticut:* Georgetown; Glenville; Litchfield; Sound Beach; Stamford. *New York:* Aqueduct, L. I.; Brownsville; Cayuta Lake; Crugers; Farmingdale, L. I.; Fort Lee; Ithaca; Kissena Lake, L. I.; Larchmont; Middletown; N. Fairhaven; Nyack; Oak Orchard Swamp; Pelham Park; Schenectady; Sea Cliff; Staten Island; Troy; Van Cortlandt Park; West Farms. *Pennsylvania:* Philadelphia. *New Jersey:* Alpine; Anglesea; Arlington; Elizabeth; Lakewood; Larchmont; Paterson; Wildwood. *Virginia:* E. Falls Church. *South Carolina:* Clemson College. *Georgia:* Savannah. *Michigan:* Cheboygan Co.; Detroit; Douglas Lake. *Indiana:* So. McAlester. *Illinois:* Palos Park; McBride. *Iowa:* Lake Okoboji; Benton Co. *Manitoba:* Aweme; Baldur; Melita. *Nebraska:* Omaha (Childs Point). *Kansas:* Linn Co; Douglas Co. *Texas:* Colorado Co. *New Mexico:* Lake Earford. *Colorado:* Colorado Springs; Wray. *Utah:* Provo. *California:* Florence (Florence Co.). *Montana:* Roundup. *Oregon:* Freewater; Huntingdon; Newport. *Washington:* N. Yakima; Pasco; Spokane; Sprague; Wawawai. *Alberta:* Lethbridge. *British Columbia:* Kamloops; Keremeos.

Biology

All the species of *Microrhopala,* north of Mexico at least, as far as is known are leaf miners in the larval state and external feeders as adults. All are apparently restricted to the members of the family *Compositae*. *Vittata* has been recorded upon the following plants: *Silphium laciniatum* L.—Hendrickson 1930; *Solidago sempervirens* L.—Harris 1935; *S. canadensis* L.—Chittenden 1902, Ross 1936, and other observers; *S. juncea* Ait.—Ross 1936; *S. graminifolia* (L.) (*lanceolata*)—Chittenden 1902. There is also an unpublished record of its occurrence upon *S. missouriensis* Nutt. Ross, 1936, has observed that it does not attack *S. rugosa* Mill. It seems to prefer species of *Solidago* to all other plants.

It passes the winter in the adult state in the ground among the bases of the stalks of the host plant and beneath rocks and logs. At Breesport, New York, two were taken April 1, 1936, from beneath stones by Harvey Scudder. Hendrickson (Can. Ent. 1930) reports finding three adults about four inches below the surface of the ground among the bases of old stalks near Ames, Iowa, on May 6, 1927.

As soon as the weather becomes warmer, and the first leaves of the goldenrod have appeared, the adults may be found crawling about over the leaves. Copulation and oviposition begin immediately. Hendrickson observed oviposition near Ames, Iowa, as early as May 7, 1927. In a small field at Ithaca, N. Y., I have observed these processes on May 16, 1936, and again at the same place one week later.

In ovipositing, the female lays one or more closely appressed clusters of eggs usually numbering less than ten in a cluster. Hendrickson (1930) observed them deposited near the apex on the upper surface of a basal leaf of *Silphium laciniatum* L. On *Solidago canadensis* L. at Ithaca I have observed eggs deposited also near the apex of the leaf, but usually on the underside and on blades near the middle of the plant axis. The eggs are oval in shape, flat, white, and lie at an angle to the surface so that one end of each egg touches the leaf. This arrangement may be likened to a row of bricks placed close together on end, that have been pushed over so that all still lie close together, but resting upon each other at an angle to the supporting plane surface. After each cluster is laid the female proceeds very carefully to cover it with a brownish substance, which may be excremental. The tip of the abdomen is passed backward over the eggs and when brought forward the semi-fluid, muddy material is distributed over them in a wide band. This is repeated until the cluster is entirely covered. In a short time this material dries, becomes black and hard, and firmly presses and glues the eggs against the surface of the leaf. Several such clusters of eggs are laid together in parallel, contacting rows. Often several egg masses lie closely together, and tend to wrinkle the leaf near the tip.

The developing embryo lies head downward, and upon hatching, the larva needs only to begin eating to enter the leaf. The position of the legs of the embryo just before hatching is variable. In alcoholics they may be directed posteriorly on both sides of the body, or posteriorly on one side and anteriorly on the other. These variations in position possibly result from movements before hatching.

The time necessary for hatching is probably somewhat less than three weeks. Hendrickson reports hatching on May 28, 1927, at Ames just twenty-one days following oviposition. Ross (1936) in his thesis on Cecidology of Solidago says: "The larvae arrive about the first of June. They mine the leaves of both vegetative shoots and uprights making sacklike pockets therein in which pupation takes place and which are later used by the adults for shelter against sunlight and storm." With regard to the appearance of the mines and the duration of feeding I quote Hendrickson (1930): "Following the mining of the leaf, the upper and lower epidermis became brownish and bulged out slightly. From observations of ink marks placed on the upper epidermis of the leaf, it appeared on June 23 that the larvae had stopped their feeding." According to my own observations the mine is elongate, and somewhat inflated as indicated above. It is often occupied by more than one larva. They are not confined to a single mine but are able to leave it and migrate to another leaf.

There is no published data, to my knowledge on the number of larval instars that occur. I have seen larvae, however, of four and possibly five different stages.

With regard to time necessary to reach the pupal stage, Hendrickson (1930) observed that pupation had already taken place on the above date when the mine referred to was taken indoors and several pupae were observed within the mine. This would seem to fix the larval period at something less than twenty-six days. Harris (1835) also noted that pupation occurred within the mines, and marked its duration as about one week. Hendrickson (1930) reports an identical observation. Of the pupae taken June 23 (1927) he says: "Three adults appeared on June 29, and two more June 30. A pair mated and a few uncovered eggs were layed by the female July 2."

It is not known definitely how many generations appear in a season, but it is apparent from my own observations as well as those of Hendrickson (1930) that there are at least two.

The adults after emergence begin feeding externally upon the host, continuing the ravages of the larvae by feeding upon the edges and surface of the leaves after causing holes to appear in them.

No predacious enemies have been recorded for *vittata* but it is probable that it is fed upon by a number of predatory insects. Birds must also take a considerable toll. Of parasites, Chittenden reports it to be host for an undesignated Chalcid.

M. vittata is itself the accidental enemy of certain other insects. Ross states that the larval Cecidomyid *Eurosta solidaginis* Fitch is seriously affected by damage to its host plant and gall.

Microrhopala excavata (Oliv.)

1808 *Hispa excavata*—Olivier, Entomologie, V. 6, p. 775, pl. II.
1837 *Microrhopala excavata*—Dejean, Cat. Col. p. 389.

Description

Length 4.5–6.5 mm.

Head with three longitudinal grooves on vertex equal in width.

Dorsal surface of pronotum densely and deeply punctured, sides of pronotum with distinct median angle.

Lateral edges of elytra gently diverging and distinctly serrulate, surface coarsely punctured, punctures of the medial rows smaller, more elongate and regular, punctures of the lateral rows larger, coarser, somewhat confluent, intervals between 4th and 5th, and 6th and 7th puncture rows raised in all but a very few specimens.

Excavata varies more in general color than any other *Microrhopala* excepting *cyanea.* It is usually entirely bluish black or bluish violaceous with the ventral surface submetallic and darker. Specimens from the south are often bronzed. The ventral surface is submetallic and dark. *Excavata* likewise varies considerably in sculpture and in such instances may be difficult to distinguish from *erebus* and *cyanea. Cyanea,* however, is smoother in appearance and shows less difference in size of medial and lateral punctures; and in *excavata* the puncture rows are always straighter and never as confused as in *erebus.*

Distribution

Excavata has been most extensively collected in the East and N. East. It is found in New Brunswick and all the Atlantic States with the possible exception of Florida. It is found in western Kansas and probably elsewhere in the Mississippi Basin.

Type Locality "l'Amerique septentrionale."

Locality records

New Brunswick: Bathurst; St. John. *Quebec:* Chelsea; Wright. *Ontario:* Go Home Bay; Honey Harbor; London; Ottawa. *Maine:* Hollis; Lake Sebago; Mount Desert; Salisbury Cove; Southport. *New Hampshire:* Crawford Notch; Franconia; Lancaster; Milton; Mt. Washington; Valley Meadow (White Mts.); Wilton. *Massachusetts:* Brookline; Sherborn; Tyngsboro. *Connecticut:* Litchfield. *New York:* Big Indian Mountain (Catskill Mts.); Canton; Chateaugay Lake (Adirondack Mts.); Ithaca; West Point. *Pennsylvania:* Hummelstown. *New Jersey:* Atco; Lahaway; Middlesex County; Montclair; Plainfield; Ramsey. *Maryland:* Bladensburg. *West Virginia:* White Sulphur Springs. *Virginia:* Glencarlyn; Skyland (Page Co.). *North Carolina:* Highlands; Southern Pines. *South Carolina:* Beaufort. *Alabama:* Chickasaw; Mobile. *Mississippi:* Richton. *Illinois. Kansas:* Linn Co., Pottawatomie Co., Riley Co.; Wallace Co. *Minnesota:* Mara.

Microrhopala cyanea (Say)

1823 *Hispa cyanea*—Say, Journ. Acad. Nat. Sci. Philad. 3:433.
1841 *Hispa hecate*—Newman, Ent., London 1:77.
1853 *Microrhopala cyanea*—Melsheimer, Cat. desc. Col. U. S. p. 119.
Hispa hecate ibid.
1873 *Microrhopala cyanea*—Crotch, Proc. Acad. Nat. Sci. Philad. 25:82–83.

Description

Length 4.5 mm.–6.5 mm.

Head finely punctate at occiput. Anterior edge of pronotum straight, posterior edge arcuate at middle, lateral edges more or less sinuate, dorsal surface coarsely punctate. Edges of elytra parallel anteriorly, slightly divergent posteriorly and of elytra parallel anteriorly, slightly divergent posteriorly and becoming rounded, humeri not prominent as in *erebus,* more so than *floridana;* edges gently serrate apically or not; punctures in four pairs of even rows, smaller throughout than in any other unicolorous species, interval between sixth and seventh rows distinctly raised, occasionally not after anterior third; dorsum bluish violaceous, blue, green or coppery, usually decidedly metallic; venter similarly colored, darker, more metallic.

Microrhopala cyanea is the most metallic and the most variable in color of any species in this genus. There are specimens which exhibit bronze, green, blue or purple as well as various degrees of each. These phases are possibly correlated with the geographical distribution of the insect, though there is small evidence to show it.

Distribution

Cyanea is found in the central part of the United States in a broad diagonal belt from Utah and Arizona to Manitoba.

Type Locality—Region of Rocky Mountains.

Locality Records

Illinois: Palos Park; Witlo Springs. *Manitoba:* Aweme. *Iowa:* Lake Okoboji. *Kansas:* Arkansas River Valley; Bourbon Co.; Clarke Co.; Douglas Co.; Ellis Co.; Ford Co.; Kiowa Co; Linn Co.; Logan Co.; Norton Co.; Reno Co.; Riley Co.; Rooks Co.; Scott Co.; Sylvia; Wallace Co. *Colorado:* Estes Park; Regnier. *Utah:* St. George; Zion Canyon. *Arizona:* Prescott.

Microrhopala erebus (Newm.)

1841 *Hispa erebus*—Newman, Ent. London 1: 77.
1878 *Microrhopala erebus* Schwarz, Proc. Amer. Philos. Soc. Philad. 18: 369.

Description

Length—5 mm.–6.5 mm.

Oblong ovate, broader proportionate to length than any other species. Head sparsely punctate, vertex with 3 longitudinal striae of equal width. Pronotum considerably wider posteriorly, much narrower than elytra; anterior edge straight, posterior edge broadly arcuate at middle, lateral edges sinuate, usually distinctly angulate. Elytra parallel basally, gently divergent, becoming rounded apically, humeri more prominent than in any other species, edges of elytra coarsely serrate, surface very coarsely punctate, punctures always irregular and contiguous, especially at sides; color uniform blue black throughout.

In *erebus* there is little or no color variation. The insect is always a uniform blue black. Its exceedingly rough configuration makes it one of the most distinct species. Although a few specimens of *excavata* are so coarsely sculptured as to resemble *erebus* the distribution and the proportionately narrower prothorax of *erebus* will serve to distinguish them.

Distribution

Erebus is found exclusively on the Florida peninsula as far as records I have been able to accumulate show. It possibly extends into neighboring states in the Gulf strip.

Type locality—"St. John's Bluff in East Florida."

Locality Records

Florida: Capron; Cedar Keys; Clearwater; De Leon Springs; Dunedin; Enterprise; Fort Myers; Indian River; Marco; Ormond.

Biology

Of this species Blatchley makes the following note: "Nov.–Apr., on oak, goldenrod and low herbage."

Microrhopala floridana Schwarz

1878 *Microrhopala floridana*—Schwarz, Proc. Amer. Philos. Soc. Philad. 18: 369.

Description

Length app. 5 mm.

Form more nearly parallel, and width of base of pronotum more nearly approaching width of elytra than in any other species. Head not coarsely punctate, of three longitudinal grooves on vertex, middle one is widest. Thorax at base slightly wider than long, sides nearly straight, nearly parallel; posterior edge of pronotum arcuate in middle, sinuate at sides, surface coarsely, evenly punctate. Intervals between fourth and fifth, and sixth and seventh rows of elytral punctures distinctly and rather strongly carinate; edges faintly or not dentate, humeri characteristically never prominent. Color bluish black, moderately shining.

This is a rather small species appearing more cylindrical in outline because of the proportionately wider prothorax and the very slight prominence of the elytral humeri. It is not noticeably variable in color, never deviating from a uniform, very dark blue black.

Type—U. S. National Museum.

Distribution

As its name implies, the center of distribution for *floridana* is Florida. It does, however, extend northward into Georgia and westward into Alabama.

Type Locality—Sumpter County, Florida.

Locality Records

Alabama: Kushla. *Florida:* Baldwin; Bartow; Dunedin; Enterprise; New Smyrna; Sumpter County; Tampa. *Georgia:* Billy's Island (Okefinokee Swamp).

Biology

Very little is known of the life history and biology of this species. It has been reared by Messrs. Hubbard and Schwarz at Crescent City and Bartow Junction, Florida, from larvae found mining in the terminal portion of the leaves of grass-leaved golden aster, *Chrysopsis graminifolia* (Michx.). Blatchley makes the following note; "Dec.–Apr., on the hoary lupine, *Lupinus diffusus* Nutt."

Microrhopala xerene (Newm.)

1838 *Hispa xerene*—Newman, Ent. Mon. Mag. London. 5: 390.

1864 *Microrhopala xerene*—Baly, Ann. Mag. Nat. Hist. 14: 269.

1865 *Microrhopala xerene* var. *interrupta*—Couper, Canad. Nat. and Geol. 2: 63.

Description

Length 4.5 mm.–5.5 mm.

Head black, rather densely punctate.

Pronotum closely punctate, edges posteriorly nearly parallel, anteriorly convergent before middle, lateral margins slightly foliaceous; black, with two wide longitudinal reddish yellow bands, occasionally absent.

Elytral humeri rather prominent, lateral edges of elytra nearly parallel, edges very faintly dentate posteriolaterally; eight regular rows of deeply impressed punctures, deeper laterally, shallower and more elongate medially.

Color black, vittae yellow, raised, width variable, length from bands on pronotum to juncture of fourth and fifth rows of punctures, elongate reddish yellow spot at angle of interval between second and third rows.

Var. interrupta—Resembles typical form except that: "A reddish yellow stripe near the lateral margin of the thorax is continued on half the elytra, occupying the distance of thirteen punctures, where it terminates,—but the stripe occurs again on the same laevigated ridge, posteriorly for the length of five punctures." This variety occurs in the northern range of the typical form.

Xerene is one of the least variable species of *Microrhopala.* There is little or no variation in size, and structure. The only color variation aside from that named var. *interrupta* is a form in which the prothorax is entirely black, a rather rare aberration.

Distribution

Microrhopala xerene is essentially an Eastern species and is found most commonly in the eastern Canadian Provinces and the Atlantic States north of Florida. I have seen specimens however labeled "Lethbridge, Alberta"; "Colorado Springs, Colorado"; and "Texas." The var. *interrupta* is usually northern, found in northern New York, Vermont, New Hampshire, Maine and Canada. Among a series in the National Museum labeled "Texas" there is a specimen of *interrupta.*

Type Locality—var. *interrupta*—Hermitage, North of Quebec.

Locality Records

New Hampshire: Franconia. *Massachusetts:* Lowell; Mt. Washington; Stow. *Connecticut:* Cornwall; Litchfield. *New York:* Ilion; Ithaca; Oneonta; Suffern; Troy. *Pennsylvania:* Germantown; Glenolden; Philadelphia. *New Jersey:* Atco; South Camden. *District of Columbia. Virginia:* Falls Church; Glencarlyn; Great Falls. *West Virginia:* White Sulphur Springs. *North Carolina:* Black Mountains; Swannea Valley. *Georgia:* Savannah. *Texas. Colorado:* Colorado Springs. *Alberta:* Cypress Hills; Lethbridge.

Biology

Like the other members of the genus no extensive work has been done upon the life history of *M. xerene.* The only study has been made by Chittenden, 1902. Of the food habits I quote: "the larvae—has been found mining the leaves of several genera of *Compositae,* although different species of goldenrod appear to constitute its principal food. The plants upon which the larvae have been observed to make their mines and from which the beetles have been reared include: *Solidago canadensis, caesia, juncea,* et al.; *Boltonia asteroides; Seriocarpus asteroides,* or toothed white topped aster, and several species of the true aster or starwort."

Essentially the life history of *xerene* seems to closely resemble that of *vittata.* The eggs are smaller and are likewise closely appressed to the surface of the leaf to which they are attached. They are coated with dark, nearly black excrement, sometimes all the eggs of a group being covered by a common coating. Usually the eggs are placed on the lower surface of the leaf near the apex, but occasionally a few are laid on the upper surface.

The larvae have the power to pass from leaf to leaf, and in captivity have been seen to leave the mine and reenter the leaf at a fresh point.

The mines are variable and sometimes occupy a considerable portion of the leaf, occasionally harboring as many as four individuals. At the point where the pupal cell is formed the mine puffs up to form a hard blister, rather rounded oval in shape, usually a little over an eighth of an inch wide, which sometimes becomes as thick through, its dimensions dependent upon the number of individuals inhabiting it.

The pupal state lasts from four days to about one week. The pupae are able to move by elevating the abdominal segments and moving forward the last segment, thus giving a forward impetus when the body is straightened. They have been observed to make as many as twenty consecutive movements.

Four parasites have been reared from this leaf miner near the District of Columbia: *Eurytoma albitarsis* Ashm. from mines in Solidago, *Closterocerus tricintus* Ashm. from a mine in *Seriocarpus asteroides* (L.) BSP. *Tetrastichus microrhopalae* Ashm. from dried larval skins, July 7–14, *Mesocrena microrhopalae* Ashm.—a single example reared July 6 from a white cocoon in a mine of this beetle.

The above observations are from Chittenden.

Microrhopala rubrolineata (Mann.)

1843 *Odontota rubrolineata*—Mannerheim, Bull. Soc. Nat. Moscou 2: 307.
1859 *Microrhopala signaticollis*—Leconte, Proc. Acad. Nat. Sci. Philad. 11: 82.
1864 *Microrhopala bivitticollis*—Baly, Ann. Mag. Nat. Hist. 14: 268–271.
1873 *Microrhopala rubrolineata* Crotch, Proc. Acad. Nat Sci. Philad. 25: 82–83.
1883 *Microrhopala vulnerata*—Horn, Trans. Amer. Ent. Soc. Philad., 10: 291, 292.
1911 *Microrhopala rubrolineata* var. *vulnerata*—Weise, Ann. Soc. Ent. Belgique 55: 72–74.
1925 *Microrhopala rubrolineata* var. *militaris*—Van Dyke, Pan-Pac. Ent. 1: 173.

Description

Length from 4 mm. in var. *militaris,* 4.5–5.5 mm. in *rubrolineata,* to 6 mm. in var. *signaticollis.*

Similar to *xerene* in shape, slightly larger.

Pronotum with close, deep, never closely appressed punctures, anterior edge nearly straight, slightly arcuate, posterior edge widely arcuate, lateral edges more or less sinuate, usually less foliaceous than in *xerene,* anterior angles more produced.

Elytra subparallel, rounded apically, four pairs of rows of close, even punctures, edges more distinctly and strongly serrate than in *xerene.*

Color bluish or violaceous, often metallic, pronotum marked with two lateral longitudinal reddish yellow bands; elytra with reddish yellow vittae on raised interval between fourth and fifth puncture rows, sub-apical spot when present, at juncture of second and sixth intervals; venter always metallic blue or blue black.

The pronotum sometimes has no color markings and is entirely unicolorous blue or blue black. *Rubrolineata* in color markings at least, is the most versatile member of the genus. Three named varieties are mentioned below, but the variations of color and pattern do not end here. The elytra markings vary from no markings at all as in var. *signaticollis* to very broad marks extending the full length of the elytra making them appear more reddish yellow than blue. The color pattern of the thorax varies in the same manner from no light markings at all to conditions where there remains only a narrow median dark line. The color also varies from bright metallic blue to very dark violaceous. The metallic blue venter is, however, a very constant character.

Distribution

Rubrolineata is in a sense the western counterpart of *xerene*. It occurs most commonly, and with the greatest degree of variation in California and Arizona. I have seen a specimen in the National Museum Collection labelled "St. Louis, Mo.," a very unusual record.

Type Locality—California.

Locality Records

California: Carpenteria; Huntingdon Beach; Indian Joe Spring; Island Mountain, Trinity Co.; Long Beach; Orange Co.; Riverside; San Diego; San Pedro; Tehuachapi; Whittier. *Arizona:* Chiricahua Mountains; Huachuca Mountains; Santa Catalina Mountains. *New Mexico:* Alamogardo. *Colorado:* Denver. *Missouri:* St. Louis.

Biology

I have seen specimens of *M. rubrolineata rubrolineata* (Mann.) from Santa Catalina Mountains of Arizona taken on *Franseria acanthicarpa* (Hook.) Coville. A specimen from St. Louis, Missouri, much larger than the average *rubrolineata,* was taken on *Helianthus hirsutus* Raf.

Microrhopala rubrolineata var. *vulnerata* Horn

Description

Size, form, sculpture as in var. *rubrolineata.*

Thorax black or blue black without markings. Elytra black or blue black, vittae widened basally from fourth to seventh puncture rows inclusive, narrower apically, obsolete after apical fourth of elytra. Variable.

In some specimens the elytral vittae are narrower, or longer, or shorter. In others the pronotum may have two longitudinal lateral reddish yellow bands as in *rubrolineata.*

Type—Philadelphia Academy of Sciences, Philadelphia.

Type Locality—Arizona.

Locality Records

Arizona: Hot Springs; Huachuca Mountains; Oak Creek Canyon; Santa Rita Mountains; White Mountains. *California:* Prescott.

Biology

The only notation relating to the biology of *M. rubrolineata* var. *vulnerata* Horn is the following note in the Pan-Pacific Entomologist, 1925, by W. W. Jones and H. Brisley. "*Microrhopala rubrolineata* var. *vulnerata* Horn, while collecting mined leaves of *Solidago californica* Nutt. near the summit of Mingus Mountain, 7500 feet, adjacent to Jerome, on August 28 (1929) beetle larvae were found to be present. Adults were secured from mines very soon thereafter. The mines were quite numerous and relatively large. They were not noted elsewhere."

Microrhopala rubrolineata var. *signaticollis* Lec.

Description

Resembles *rubrolineata* in size, form and configuration. Elytral vittae entirely absent, elytral surface unicolorous. The pronotum usually has the typical reddish yellow lateral markings, but these are sometimes completely obsolete. In the latter condition the specimen may be confused with one or more of the normally unicolorous species. It is readly separated from any of these by its extreme western occurrence, and by the punctures which are close, regular and nearly the same size throughout.

Type—Museum of Comparative Zoology, Cambridge.

Type Locality—Tejon, California.

Locality Records

California: Ahwahnee; El Cajon; El Taste; Indian Joe Spring; Lancaster; Los Angeles; Palm Springs; San Diego; Santa Rosa;

Tasajara Hot Springs, Monterey County to Tuolumne County; Tehachapi.

Microrhopala rubrolineata var. *militaris* Van Dyke

Description

Thorax reddish yellow, dark area reduced to median longitudinal line. Humeral region of elytra with wide, squarish, reddish, yellow mark, sharply obsolete before middle of elytra.

Rubrolineata is perhaps the most variable of the species of *Microrhopala.* There are numerous other patterns of both pronotum and elytra which might be named as new varieties. There seems to be nothing to be gained by this, however, at least not until a much larger amount of material is accumulated, in order that the range of the various phases, if possible, can be worked out. There is some doubt of the feasibility of this because of the possibility of free interbreeding between various color forms at the edges of their respective localities. At any rate the problem can only be adequately worked out by an investigator who has available considerably more material than has been accumulated in the east.

Type—Museum of the California Academy of Sciences.

Type Locality—Siskiyou County, California.

Locality Records

Arizona: Grand Canyon; Hot Springs; Williams. *California:* Lancaster; Los Angeles; Mount Shasta District.

SPECIES ERRONEOUSLY PLACED IN THE GENUS MICRORHOPALA.

Uroplata uniformis (Smith) new combination.

This southwestern species so closely resembles *Uroplata porcata* (Melsheimer) that it is difficult to separate it from that species. Smith compares the two as follows: "Differs from *porcata* by not having the vertex sulcate, by the longer thorax, the sides more distinctly arcuate, and by the more robust form." I have found it very difficult to separate the two species with certainty except by their locality data. There is surely no doubt that *uniformis* and *porcata* belong in the same genus.

Uniformis differs from all species of *Microrhopala* by having the thorax longer than wide, and more cylindrical. Further, the elytral puncture rows are not arranged in four regular pairs throughout, there being four rows of punctures between the second and third costae at the apical fourth. *Uroplata porcata* differs from *Microrhopala* by the same characters.

Type—U. S. National Museum.
Type Locality—Arizona.

ACKNOWLEDGMENTS.

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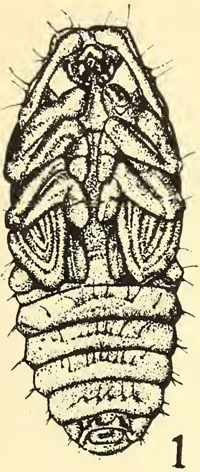

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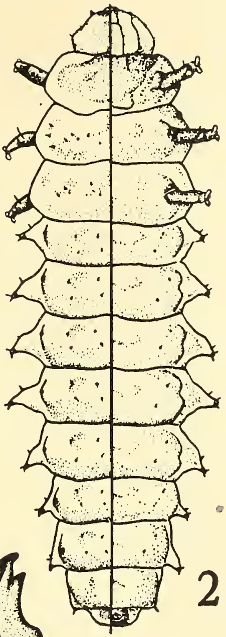

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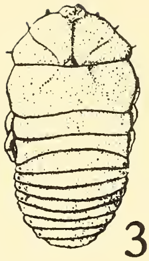

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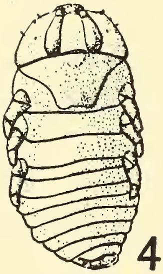

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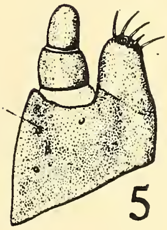

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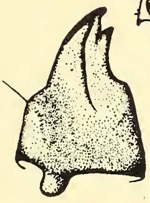

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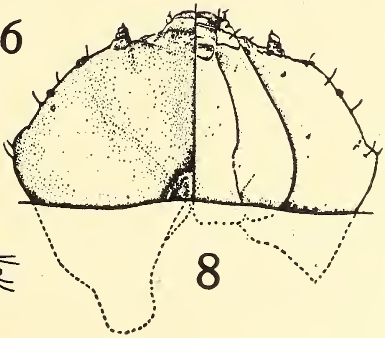

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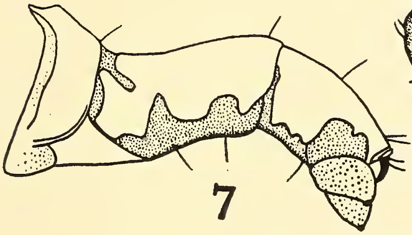

7

Microrhopala vittata.

1. Pupa, ventral view.
2. Larva, last instar, dorsal and ventral view.
3. Embryo just prior to hatching, dorsal view.
4. Embryo just prior to hatching, ventral view.
5. Right maxilla, larva, last instar, ventral view.
6. Right mandible, larva, last instar, ventral view.
7. Left mesothoracic leg of larva, last instar.
8. Head of larva, last instar, dorsal and ventral view.

A NEW SPECIES OF NEOCORIXA (CORIXIDAE-HEMIPTERA).

H. B. Hungerford,
Lawrence, Kansas*

The genus *Neocorixa* was erected in 1925 for a species taken in the Santa Rita Mountains of Arizona by F. H. Snow and named *Neocorixa snowi* Hungerford. The genus is characterized not only by the sinistral asymmetry of the male but by a definite and characteristic asymmetry of the female abdomen as well. The species *N. snowi* Hungerford is now represented in our collections by specimens bearing the following labels: Gila Co. Ariz., Aug. 5, 1927, L. D. Anderson and P. A. Readio, R. H. Beamer; Santa Rita Mts. Ariz., July 17, 1932, R. H. Beamer; Huachuca Mts. Ariz., July 8, 1932, R. H. Beamer; Torrance Co. N. M., July, 1925, C. H. Martin; Mexico, Orizaba, Vera Cruz, July 30, 1937, H. D. Thomas; Mexico, Saltillo, Coahuila, Sept. 10, 1937, H. D. Thomas; Mexico, Pueblo, Puebla, July 24, 1937, H. D. Thomas; Mexico, San Antonio near El Salto, 5000 ft. a.s.l. semitropical, June 10, 1937, Meldon Embury; Mexico, San Antonio, near El Salto, 9300 ft. above sea level, Pine Forest, June 5, 1937, Meldon Embury; Mexico, near Santa Rosa, Guanajuato, Aug. 14, 1932, Hobart Smith; Mexico, near L. Cuitzeo, Michoacan, Aug. 10, 1932, Hobart Smith; Mexico, May–June, 1933. Real de Arriba, District of Temascaltepec, alt. 1960 meters, H. E. Hinton.

Thus *Neocorixa snowi* Hungerford has been taken in Arizona, New Mexico and several places in Mexico.

During this past summer H. D. Thomas collected a new species of Neocorixa in Chiapas, Mexico. This is south of the known range of *Neocorixa snowi* Hungerford.

Neocorixa picta n. sp.

Size: Length 7.9 mm. to 8.5 mm.; width of head 2.6 mm. to 2.8 mm.

Color: General color dark, both dorsum and venter, but slightly lighter than in *Neocorixa snowi* Hungerford because of the much coarser barring on pronotum and hemelytra and an extension of the pale areas on the venter. The mesothoracic epimeron, for example, is light in color, whereas in *N. snowi* it is usually suffused with black. Head and legs yellowish to ivory. Pronotum crossed by about a dozen slender, much broken and anastomosing black bands. The zig-zag banding of the hemelytra coarse—the pale bands, on the whole, as broad at least as the black—the pattern continuing uninterrupted on the membrane.

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* Contribution from the Department of Entomology, University of Kansas.

Structural Characteristics: The so-called beak reduced. Frontal depression of male broadly oval, not reaching the eyes, this area in both sexes densely clothed with fine white hairs. Lower margin of basal half of front femur provided with a few strong spines. Front tarsus long, slender, tapering to single stout claw in both sexes. The male pala provided with about 44 pegs arranged in a row along the lower margin. The asymmetry of the male sinistral but no strigil or patch of short hook-like projections. The genital capsule of male as shown in Pl. VII, fig. 4.

The last ventral abdominal segment of female rectangularly produced as shown in the drawing and the notch on the inner ventral margin of the anal lobes shallow.

Described from 67 specimens (24 males and 43 females) bearing the label "San Cristobal, Chiapas, Mexico, Sept. 2, 1937, H. D. Thomas."

Comparative Notes: This species is distinguished from *N. snowi* Hungerford by the broad pale bands in the zig-zag pattern of the hemelytra, by the shape of the genital clasper, the lack of the stridular patch in the male, and by the shape of the last ventral abdominal segment and the anal lobes in the female. See the drawings on Plate VII, figures 1 to 8.

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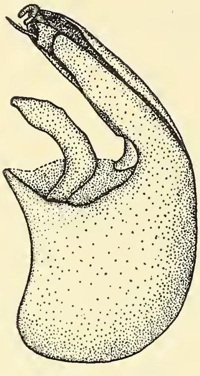
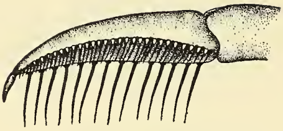


1. N. snowi



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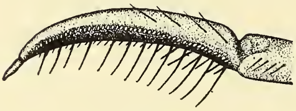
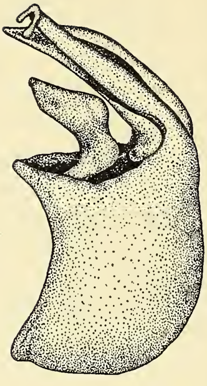
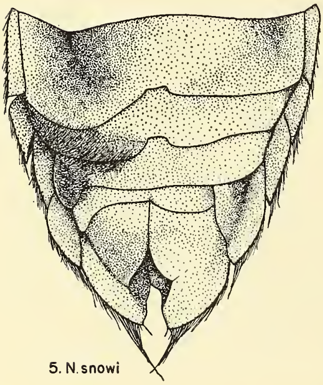


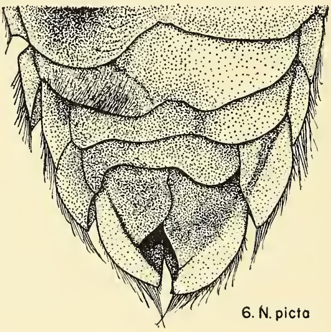
3. N. picta



4. N. picta



5. N. snowi



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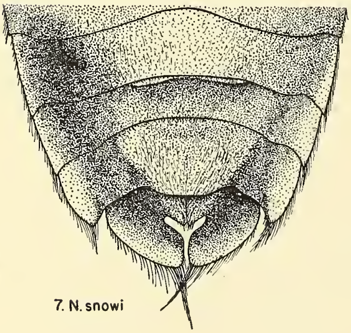
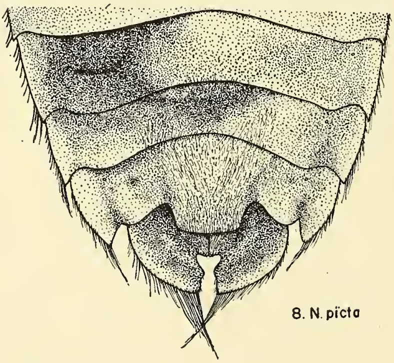


7. N. snowi



8. N. picta

NEW SPIDERS FROM NEW ENGLAND WITH NOTES ON OTHER SPECIES.

By B. J. Kaston, New Haven, Conn.

The types of the new species described in this paper will be deposited in the Museum of Comparative Zoology. I wish to thank Miss E. B. Bryant, of that institution, and Dr. W. J. Gertsch, of the American Museum of Natural History, for permitting access to type and other material for study in the preparation of this paper. Facilities for this study and financial support making possible the inclusion of the illustrations have been furnished by the Connecticut Geological and Natural History Survey, through Dr. W. E. Britton, its Superintendent.

DRASSIDAE.

Rachodrassus monroensis n. sp. (Figures 1 to 4.)

Male. Total length 4.8 mm. Carapace 2.2 mm. long, widest between 2nd and 3rd coxae, where it is 1.55 mm., and narrowed to .49 at clypeus; highest at the quite distinct dorsal groove. Carapace yellow, sparsely covered with short black hairs.

Eyes in two rows; ratio of AME:ALE:PME:PLE = 7:10:7:8. First row slightly procurved, the AME separated from each other by less than a radius, and from the ALE by about a radius. Second row broader than first (44:35), slightly procurved, the medians separated by about a diameter, and slightly more than a diameter from the laterals. Median ocular area wider behind than in front (19:14), slightly longer than wide (21:19). Laterals of each side separated by slightly more than the radius of ALE.

Height of clypeus 4/7 diameter of AME. Chelicerae vertical, .84 mm. long, with oblique margins and with boss. Fangs long and thin, and overlapping each other. Promargin with well developed scopula and three teeth, the middle tooth being largest, and proximal smallest. Retromargin with two teeth, equal in size to distal tooth on promargin. Arising on the promargin near the base of the fang is a thick hair, curved and paralleling the fang and longer than the latter. On the retromargin is another, but somewhat shorter, hair. Maxillary endites parallel, evenly rounded in front, widest about 1/3 the distance from the base, with well developed scopulae. Labium broader than long (23:15), not extending beyond middle of maxillae. Sternum longer than wide (29:26), light yellow in color like the labium and endites. Hind coxae separated by 1/5 their length.

Legs 4123, slightly darker than carapace, and without markings. Trichobothria numerous on tibiae, metatarsi, and tarsi. Claw tufts poorly developed, and weak scopulae on tarsi.

	Femur.	Patella + Tibia.	Metatarsus.	Tarsus.	Total.
Leg I...	1.68	2.52	1.26	.84	6.30 mm.
Leg II...	1.68	2.10	1.17	.93	5.88 mm.
Leg III...	1.55	1.89	1.47	.84	5.75 mm.
Leg IV...	2.10	2.80	2.30	.97	8.17 mm.

Tibial index of Leg I is 11.6, of Leg IV, 10.9.

Spines as follows: Leg I, femur dorsal 1–1–1, prolateral 1; patella ventral 1; tibia ventral 2–2, longer than the thickness of segment; metatarsus ventral 2–2, prolateral 1 distal, retrolateral 1 distal. Leg II, like I except none on patella and an additional prolateral on metatarsus. Leg III, femur dorsal 1–1–1, retrolateral 1–1, prolateral 1–1; tibia ventral 2–2, prolateral 1–1, retrolateral 1–1, dorsal 1; metatarsus ventral 2–2–2, prolateral 1–1, retrolateral 1–1, dorsal 2–2–2. Leg IV, femur like III except only 1 retrolateral; patella retrolateral 1; tibia ventral 2–2–2, prolateral 1–1, retrolateral 1–1, dorsal 1–1; metatarsus like III.

Abdomen tan, somewhat darker above, with a faint lanceolate basal stripe on the midline for about half its length and five pairs of indistinct darker spots on the posterior half. There is a general covering of long black hairs, longest at the anterior end, shortest on the venter. The anterior spinnerets are about twice as long as the posterior.

Palpus with femur as long as patella and tibia together. The tibia is slightly longer than the patella and bears a sharply pointed apophysis which is about half the length of the tibia. From the ventral surface of the tibia arises a very long bristle. Tarsus wide, and with the deep alveolus occupying its entire length. Palpal organ (distended in the type specimen) as figured.

Holotype male collected by the author in Monroe, Conn., Aug. 30, 1936.

The only other species of *Rachodrassus* of which the male is known is *echinus* Chamberlin. From the inadequate description the only character which can be selected to distinguish it from *monroensis* is the possession of an additional pair of ventral spines on Tibia I and II. The palpus is not figured but a comparison with the type at the M. C. Z. reveals, among other things, the fact that in *echinus* the tibial apophysis is straight rather than curved, as it is in *monroensis,* and the tarsus is narrower than in *monroensis.*

Geodrassus auriculoides (Barrows). (Figures 5 to 8.)

Drassodes auriculoides Barrows 1919, Ohio J. Sci. XIX: 355, pl. xv, f. 4 a, b. ♀

Female. Total length 9.3 mm. Carapace 4 mm. long, maximum width 2.82 mm. between 2nd and 3rd coxae, and narrowed to 1.8 mm. at clypeus; highest between 1st and 2nd coxae. Color reddish-brown without definite markings; lightest on top, darker around the eyes and along lateral margins, and somewhat smoky on posterior declivity. There is a sparse pubescence of black hairs which are longest in eye region. Dorsal groove distinct and black.

Eyes in two rows; ratio of AME : ALE : PME : PLE = 13 : 12 : 13 : 11. First row very slightly recurved, the medians separated by 11/13 of a diameter, and a radius removed from the laterals. Second row broader than first (89 : 70), slightly procurved; the medians oval, oblique, and separated by a radius. The medians are removed from the laterals by 24/13 of a diameter of PME. Laterals of each side separated by slightly more than the diameter of either. Median ocular area broader in front than behind (35 : 31) and longer than broad (43 : 35).

Height of clypeus 17/13 diameter of AME. Chelicerae robust, darker than carapace, covered with fine black hairs, geniculate at base, and with boss. Fangs short and stout. Furrow oblique, promargin with scopula and three stout teeth. Of these the middle one is largest, the proximal smallest. Retromargin with a single tooth which is smaller than any on promargin. Maxillary endites parallel, indented on lateral face, rounded anteriorly, with well developed scopula, and with an oblique depression on ventral face. Labium darker than endites, longer than broad (58 : 42), extending beyond middle of maxillae. Sternum heart-shaped, widest between 2nd coxae, broadly truncate in front, pointed behind, longer than broad (79 : 54), and darker in color along border. Fourth coxae separated by about $\frac{1}{3}$ their length.

Legs 4123, yellowish brown, darker above, with fine black pubescence. Scopulae on tarsi and metatarsi of legs I and II; on tarsi and distal half of metatarsi of leg III; and on tarsi of leg IV. Claw tufts well developed. Trichobothria numerous on tibiae, tarsi, and metatarsi.

	Femur.	Patella + Tibia.	Metatarsus.	Tarsus.	Total.
Leg I...	2.82	3.66	1.92	1.62	10.02 mm.
Leg II...	2.70	3.42	2.10	1.50	9.72 mm.
Leg III...	2.58	3.24	1.92	1.32	9.06 mm.
Leg IV...	3.30	4.20	3.00	1.62	12.12 mm.

Tibial index of Leg I is 12, of Leg IV is 12.2.

Spines as follows: Leg I, femur dorsal 1–1, prolateral 1; tibia ventral 1; metatarsus ventral 1. Leg II, like I but with an additional prolateral spine on femur. Leg III, femur dorsal 1–1–1, prolateral 1–1, retrolateral 1–1; tibia dorsal 1 near base, prolateral 1–1–1, retrolateral 1–1–1, ventral 1–1–2; metatarsus dorsal 2–2–2, prolateral 1–1, retrolateral 1–1, ventral 2–2–2. Leg IV, femur dorsal 1–1–1, prolateral 1–1, retrolateral 1 distal; tibia dorsal 1–1, prolateral 1–1–1, retrolateral 1–1–1, ventral 1–2–2; metatarsus dorsal 2–2–2, prolateral 1–1, retrolateral 1–1, ventral 2–2.

Abdomen dark brown streaked with gray, lighter in the middle of anterior half, and with indistinct chevrons behind. Venter considerably lighter than dorsum. Spinnerets dark brown tipped with black. Epigynum with a central lobe broadened and elevated slightly behind, and with a pair of lateral depressed areas either side (figure 7).

The *male* of this species has not heretofore been described. The following is based upon a specimen in the Am. Mus. Nat. Hist., collected at Saugerties, N. Y., Sept., 1911.

Total length, 7.8 mm. In general appearance essentially like female. However, the chelicerae are more strongly geniculate and the fangs are longer and slimmer in proportion. Legs 4123.

	Femur.	Patella + Tibia.	Metatarsus.	Tarsus.	Total.
Leg I...	3.30	4.42	2.40	1.98	12.10 mm.
Leg II...	3.17	4.37	2.46	missing	....
Leg III...	2.88	3.54	2.28	1.56	10.26 mm.
Leg IV...	3.72	4.73	3.65	1.86	13.96 mm.

Tibial index of Leg I is 10.2, of Leg IV is 10.8.

Palpus: Tibia 3/5 as long as femur, almost three times as long as patella, and 3/4 as long as tarsus. Tibial apophysis quite inconspicuous, consisting of a very thin pigmented plate. Palpal organ as figured.

Record: Branford, Conn., May 22, 1936 (B. J. K.), a female with egg sac.

Geodrassus phanus Chamberlin. (Figures 9 to 11.)

Geodrassus phanus Chamberlin 1922, Proc. Biol. Soc. Washington, XXXV: 159. ♀.

This species has been known only from the type specimen from Long Island, N. Y., which, Chamberlin notes, "May be distinguished from *auriculoides* in having lateral eyes nearer each other, the shorter tib. + pat. IV, and proportions and details of epigynum." Eye measurements were given, and of course Barrows' figure of the eyes of *auriculoides* was available. I am supplying in the present paper measurements of the leg segments and figures of the epigyna of both species for comparison.

In general appearance and structure the two species are quite similar. I have before me two specimens of *phanus* which agree in being considerably lighter in color than *auriculoides.* The cephalothorax and legs are yellowish, rather than reddish brown, and the abdomen is a lighter gray and lacks even the indistinct chevron pattern of *auriculoides.* Furthermore, their epigyna differ from that of *auriculoides* in having two distinct small circular areas in each lateral lobe (figure 9) rather than one (figure 7).

While it may be true that *phanus* has the lateral eyes nearer each other than in *auriculoides* this difference is very slight. In one of my specimens the space is 9/11 of a diameter of an ALE, but in the other it is at least as great as the diameter of the subequal laterals. However, as a consequence of the front eye row of *phanus* being practically straight, the median ocular area is only one eighth longer than broad, while that of *auriculoides* being recurved, this area is one fourth longer than broad.

The proportionate length of the tibia + patella IV is not a safe character. In Chamberlin's specimen it was 4/4.38 that of the cephalothorax. In one of mine it is the same length as the carapace. In the other, however, it is 3.54/3.12 which makes it even longer than in *auriculoides* (4.2/4).

The relative leg lengths and tibial indices are about the same as in *auriculoides*. There are a few differences in the spination, of which perhaps might be mentioned tibia I ventral with 1–1, instead of just 1.

Records: Leete's Island, Conn., Sept. 29, 1935, and Sept. 12, 1937, both collected by D. S. Riggs.

Drassodes robinsoni Chamberlin. (Figures 12 to 14.)

Drassodes robinsoni Chamberlin 1919, Ann. Ent. Soc. America, XII: 245, pl. xvi, f. 2. ♀.

Female. Total length 10.2 mm. Carapace 4.2 mm. long, 3.23 mm. wide between 2nd and 3rd coxae, and narrowed to 2.04 mm. at clypeus; highest between 1st and 2nd coxae. Color orange brown without definite markings, slightly darker around eyes, and covered with a sparse pubescence of fine black hairs. Dorsal groove distinct.

Eyes in two rows; ratio of AME : ALE : PME : PLE = 15 : 14 : 15 : 13. First row practically straight, the medians separated by 12/15 their diameter, and about a radius from the laterals. Second row broader than first (98 : 78), slightly procurved; the medians oval, oblique, separated by 8/15 their diameter, and twice their diameter from the laterals. Laterals of each side separated by 17/14 the diameter of ALE. Median ocular area broader in front than behind (41 : 36) and as long as broad in front.

Height of clypeus 17/15 diameter of AME. Chelicerae robust, covered with long black hairs, slightly geniculate at base, and with boss. Fangs short and stout. Furrow oblique, promargin with scopula and three stout teeth, of which the median is largest, and the other two about the same size. Retromargin with two subequal teeth, smaller than promarginal. Maxillary endites parallel, slightly indented on lateral face, rounded anteriorly, with well developed scopula, and with an oblique depression on ventral face. Labium longer than wide (55 : 50) narrowed at anterior end, extending slightly beyond middle of endites. Sternum heart-shaped, darker along border, longer than broad (86:63) truncate in front and pointed behind. Fourth coxae separated by 1/4 their length.

Legs 4123, orange in color, like the sternum; slightly darker above. Scopulae on tarsus, metatarsus and distal fifth of tibia of leg I; on tarsus and metatarsus of leg II; on tarsus and distal half of metatarsus of leg III; and on tarsus and distal fifth of metatarsus of leg IV. All claw tufts well developed. Trichobothria numerous on tibiae, tarsi and metatarsi.

	Femur.	Patella + Tibia.	Metatarsus.	Tarsus.	Total.
Leg I...	3.60	4.55	2.70	1.68	12.53 mm.
Leg II...	3.48	4.43	2.52	1.74	12.17 mm.
Leg III...	3.12	3.72	2.34	1.56	10.74 mm.
Leg IV...	4.07	5.04	3.72	1.68	14.51 mm.

Tibial index of leg I is 11.5, of leg IV, 11.6.

Spines as follows: Leg I, femur dorsal 1–1, prolateral 1; tibia ventral 1–1; metatarsus ventral 1. Leg II, femur dorsal 1–1, prolateral 1–1; tibia ventral 0–1; metatarsus ventral 2–1p. Leg III, femur dorsal 1–1–1, prolateral 1–1, retrolateral 1–1; tibia dorsal 1 near base, prolateral 1–1–1, retrolateral 1–1–1, ventral 1p–2–2; metatarsus dorsal 2–2, prolateral 1–1, retrolateral 1–1, ventral 2–2–2. Leg IV, femur dorsal 1–1, prolateral 1–1, retrolateral 1 distal; tibia dorsal 1–1, prolateral 1–1–1, retrolateral 1–1–1, ventral 1–2–2; metatarsus dorsal 1–2–2, prolateral 1–1–1, retrolateral 1–1–1, ventral 2–2–2.

Abdomen grayish brown, somewhat lighter below. There is an indistinct, light hastate stripe in the center of the anterior half, slightly darker along its edges, and a number of indistinct chevrons on the posterior half. Spinnerets orange. Epigynum with a central lobe broadened behind, and with a pair of lateral depressed areas (fig. 12).

Records: This species, first described from Utah, has since been taken at various localities through the middle west and east. In New England specimens have been collected at Woods Hole, Mass., July 8, 1901 (H. W. Britcher); Norwalk, Conn., May 24–30, 1933, July 4, 1935 (W. J. Gertsch); and Branford, Conn., Sept. 3, 1937 (D. S. Riggs).

There seems to be considerable variation exhibited in the form of the epigynum, so that this structure may resemble that of *D. celes* Chamberlin. The specimens from Woods Hole have this structure looking even more like that of *celes* than the one from Branford represented in figure 12.

Gnaphosa fontinalis Keyserling. (Figures 15 to 17.)

Gnaphosa fontinalis Keyserling 1887, Verh. zoo. bot. Ges. Wien, XXXVII: 426, pl. vi, f. 4. ♀.

The *male* is here described for the first time. Total length 6.5 mm. Carapace 3.2 mm. long, 2.64 mm. wide between 2nd and 3rd coxae, and narrowed to 1.4 mm. at clypeus; highest at pars thoracica just posterior to dorsal groove. Color dark brown, bordered with black, and with smoky bands along radial furrows. A few short scattered hairs in eye region and along postero-lateral angles of carapace.

Eyes in two rows; ratio of AME : ALE : PME : PLE = 8 : 10 : 9 : 7. First row procurved, the medians separated by 5/8 of a diameter, and 1/4 their diameter from the laterals. Posterior row broader than first (56 : 41), recurved; the medians oval, separated by 5/9 of a diameter, and 14/9 their diameter from the laterals. Laterals of each side separated by 12/7 diameter of PLE. Median ocular area practically square.

Height of clypeus 18/8 the diameter of AME. Chelicerae vertical, with boss, light brown, with long black hairs. Fangs small. Promargin of furrow with 3 small teeth. Retromargin with the usual denticulate lobe. Maxillary endites light brown, convex on the outer margin, converging slightly in front of labium, with an oblique depression on ventral face, and a thick scopula. Labium longer than wide (35 : 28), extending beyond middle of endites. Sternum brown bordered with black, truncate in front, pointed behind, and longer than wide (62 : 53). Hind coxae separated by 1/6 their length.

Legs 4123, dark brown, with longitudinal black markings, most noticeable on femora. Tarsi and metatarsi lighter. Tarsi scopulate along distal 5/6. Claw tufts inconspicuous. Trichobothria on tarsi, metatarsi, and tibiae.

	Femur.	Patella + Tibia.	Meta-tarsus.	Tarsus.	Total.
Leg I...	2.34	2.92	1.46	1.40	8.12 mm.
Leg II...	2.13	2.68	1.40	1.23	7.44 mm.
Leg III...	1.95	2.27	1.63	1.16	7.01 mm.
Leg IV...	2.48	3.40	2.62	1.61	10.11 mm.

Tibial index of leg I is 16, of leg IV, 11.1.

Spines as follows: Leg I, femur dorsal 1, prolateral 1 distal; tibia ventral 1p–2–2; metatarsus ventral 2–2. Leg II, femur dorsal 1, prolateral 1–1; tibia prolateral 1–1, ventral 1r–2–2; metatarsus ventral 2–2. Leg III, femur dorsal 1–1–1, prolateral 1–1, retrolateral 1–1; patella retrolateral 1; tibia prolateral 2–1–1, retrolateral 1–1–1, ventral 2–2–2; metatarsus prolateral 2–2, retrolateral 1–2–2, ventral 2–1r–2–2. Leg IV, femur dorsal 1–1, prolateral 1–1, retrolateral 1–1; patella retrolateral 1; tibia prolateral 2–2, retrolateral 1–1, ventral 2–2–2; metatarsus prolateral 1–2–2, retrolateral 1–2–1–1, ventral 2–2–2.

Abdomen black covered with fine hairs, which are longer and coarser at anterior end. Anterior half with three pairs of lighter elongate spots; the first pair parallel, the second and third slightly divergent. The second pair is smallest and slightly closer together than the other two pairs which are about the same size. Venter somewhat lighter than dorsum; pulmonary areas orange-brown.

Palpus with femur longer than patella + tibia. Patella about twice the length of tibia from above. Tibial apophysis thick at base, drawn out to a blunt point. The median apophysis of the palpal organ bears a fine, curved hook distally. The embolus arises on the retrolateral surface, describes a wide arc ventrally, with its major portion normally lying in a narrow groove along the prolateral edge of the cymbium.

Female. Total length 9.6 mm. Length of carapace 4.1 mm. Essentially like male in most characters. Median ocular area somewhat longer than wide. Black markings on legs not as distinct as in male.

	Femur.	Patella + Tibia.	Metatarsus.	Tarsus.	Total.
Leg I...	2.48	3.06	1.40	1.34	8.28 mm.
Leg II...	2.19	2.77	1.32	1.20	7.48 mm.
Leg III...	2.18	2.48	1.63	1.26	7.55 mm.
Leg IV...	2.77	3.51	2.54	1.52	10.33 mm.

Tibial index of leg I is 19.1, of leg IV, 16.7.

Legs I and II with scopulae well developed on tarsi and distal half of metatarsi. Legs III and IV with scopulae poorly developed on tarsi.

Spines differing from those of male as follows: Leg I, tibia ventral 2 distal. Leg II, femur dorsal 1–1, prolateral 1 distal, tibia prolateral 0; ventral 0–1r–2; metatarsus ventral 2–2–2. Leg III, femur dorsal 1–1; tibia prolateral 1–1–1; metatarsus retrolateral 2–2; ventral 2–2–2. Leg IV, femur prolateral 1d; tibia prolateral 1–1, retrolateral 2–1–1; metatarsus retrolateral 1–2–2.

Epigynum as figured.

Records: (All Connecticut). Male (allotype) and female, Norwalk, May 18–30, 1933 (W. J. Gertsch). Female, Branford, June 12, 1936 (B. J. K.). Female, Whitneyville, July 1, 1937 (D. S. Riggs). Female, Bethany, Sept. 25, 1937 (B. J. K.).

The character of the palpal organ is such as to place this species among those others removed by Chamberlin from *Gnaphosa* to his *Cylphosa,* 1933. The females of this latter group cannot be distinguished from *Gnaphosa sens. str.*

CLUBIONIDAE

Micaria multimaculata n. sp. (Figures 18 to 23.)

Female. Total length 2.86 mm. Carapace 1.29 mm. long, widest at the 2nd coxae where it is .79 mm., and narrowed to .53 mm. at clypeus. Highest in the middle of its length, sloping gently from there forward and to the rear. Pars cephalica quite convex viewed from in front. Ground color dark brown suffused with gray, and covered with iridescent scales. White scales arranged to make a pair of spots in center, a pair between 2nd and 3rd coxae, and a pair at base of 4th coxae. Carapace clothed with sparse appressed hairs, a few longer and erect in eye region.

Eyes subequal, in two rows. First row slightly procurved, with medians slightly closer to the laterals than to each other. Posterior row broader than anterior (25: 18), straight, eyes equidistant. Median ocular area narrower in front than behind (8: 11) and about as long as wide.

Height of clypeus about 3/2 diameter of AME. Chelicerae practically vertical, with small boss. Promargin of fang furrow with one small tooth, retromargin with none. Endites indented somewhat on outer margin, with a slight oblique depression on ventral face; widened anteriad where they are inclined over labium. Labium slightly longer than broad (12: 10) extending beyond middle of endites. Sternum triangular, widest at 2nd coxae, longer than broad (45: 32), and, like the labium and endites, dark brown suffused with gray. Fourth coxae separated by 1/5 their length.

Legs 4123. Leg I with coxa black above and blackish brown beneath. Basal half of femur dark brown, distal half, patella and most of tibia white; distal tip of tibia, metatarsus, and tarsus dark brown. Leg II with coxa yellowish, mottled with brown above and on sides. Femur dark above, somewhat lighter distally below, patella and tibia light, metatarsus and tarsus darker. Legs III and IV with coxae as in leg II, with tarsi light and all other segments dark brown. All tarsi and metatarsi with a double row of thick bristles beneath, most noticeable on legs I and II. Trichobothria on tibiae, metatarsi and tarsi.

	Femur.	Patella + Tibia.	Metatarsus.	Tarsus.	Total.
Leg I...	.73	.92	.50	.48	2.63 mm.
Leg II...	.70	.78	.42	.49	2.39 mm.
Leg III...	.58	.73	.50	.44	2.25 mm.
Leg IV...	.95	1.14	.77	.50	3.36 mm.

Tibial index of leg I is 11.1, of leg IV, 9.6.

Spines as follows: Leg I, femur prolateral 1d. Leg II, femur dorsal 1 near base. Leg III, femur dorsal 1 near base; tibia ventral 1p–2; metatarsus ventral 2 distal, prolateral 1–1, retrolateral 1d. Leg IV, femur dorsal 1 near base; tibia prolateral 1–1, ventral 2 distal; metatarsus ventral 2–2–2–2.

Abdomen black above, covered with iridescent scales and fine black hairs. Groups of white scales are arranged to form five white spots on the anterior half of the abdomen, as shown in figure 18. Also partly visible from above are the two oblique white bars on each side. There is a distinct transverse depression just in front of middle as shown in figure 22. Venter not quite as dark as dorsum, yellow for a thin strip behind genital furrow and around epigynum.

Pedicel plainly visible from above. Epigynum quite large for the size of the spider; for details see figure 23.

Male. Total length 2.74 mm. In body pattern and general structure essentially like female. The abdomen has a much shallower transverse depression (figure 21), the tarsi are lighter than in the female, and the sternum is somewhat wider in proportion (44: 35). In life there is a patch of white scales on the dorsal surface of coxae III and IV, and on femur IV.

	Femur.	Patella + Tibia.	Metatarsus.	Tarsus.	Total.
Leg I...	.88	.98	.50	.54	2.90 mm.
Leg II...	.73	.88	.48	.47	2.56 mm.
Leg III...	.61	.76	.50	.39	2.26 mm.
Leg IV...	.83	.95	.81	.54	3.13 mm.

Tibial index of leg I is 9, of leg IV, 12.3.

Palpus with femur longer than patella + tibia. Patella slightly longer than tibia, the latter with an unpigmented pointed apophysis 2/5 the length of the segment. The palpal organ protrudes quite considerably from the cymbium, the details difficult to ascertain due to very slight pigmentation of the parts. The tip of the embolus lies between two of the three stout spines on the ventral side of the cymbium.

Female type, together with two males in the penultimate instar (matured Sept. 21), were collected at Bethany, Conn., Sept. 14, 1937 (D. S. Riggs).

This species is closely related to *M. laticeps* Emerton. The latter has no pattern of spots, though by the time it was described it might have lost all distinctive marks that may formerly have been present. It is only slightly smaller than *laticeps* but has the pars cephalica not quite so broad, the sternum not quite so narrow, and has a somewhat longer tibial apophysis.[1]

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[1] *M. laticeps,* described (Trans. Connecticut Acad. Sci., 1909,

PISAURIDAE

Pisaurina brevipes (Emerton). (Figure 24.)

Pisaura brevipes Emerton 1911, Trans. Connecticut Acad. Sci., XVI: 400, pl. iv, f. 6, 6a. ♀.

Pisaurina brevipes Bishop 1924, N. Y. State Mus. Bull. No. 252, p. 29, pl. vii, f. 2, pl. xxxiii, f. 5. ♀.

The *male* of this species is here described for the first time. In general appearance, color and markings it agrees fairly well with the description of the female as given by Bishop.

The typical median dorsal stripe on the abdomen has the sides practically straight and is bordered each side by a bright white line. The chief discrepancy, as might be expected, is the relative length of the legs.

Data for comparison are furnished herewith.

	Femur.	Patella + Tibia.	Meta-tarsus.	Tarsus.	Total.
Male					
Leg I . . .	4.2	6.0	3.9	2.1	16.2 mm.
Leg II . . .	4.5	6.0	4.2	2.1	16.8 mm.
Leg III . . .	4.2	5.1	3.6	1.7	14.6 mm.
Leg IV . . .	4.5	6.0	4.5	1.9	16.9 mm.

Tibial index of leg I is 10.4, of leg IV, 11.7.
Length of body 10.8 mm.

	Femur.	Patella + Tibia.	Meta-tarsus.	Tarsus.	Total.
Female					
Leg I . . .	4.5	6.0	3.6	1.5	15.6 mm.
Leg II . . .	4.8	6.0	3.6	1.5	15.9 mm.
Leg III . . .	4.2	5.1	3.3	1.2	13.8 mm.
Leg IV . . .	4.8	6.0	4.5	1.5	16.8 mm.

XIV: 214, pl. x, f. 4) from a single male, is stated to lack a tibial apophysis. Examination of the type at the M. C. Z. reveals the fact that Emerton's drawing was made from the palp from which the apophysis had been broken off. The other palp presents a small, but distinct, apophysis.

Tibial index of leg I is 13.5, of leg IV, 14.1.

Length of body 13 mm.

To facilitate comparison with *P. mira* (Walckenaer) similar data are tabulated below. An attempt was made to select for this purpose individuals of about the same body size as the above.

P. mira

	Femur.	Patella + Tibia.	Meta-tarsus.	Tarsus.	Total.
Male					
Leg I...	7.5	10.4	9.0	3.9	30.8 mm.
Leg II...	8.1	10.0	9.0	3.6	30.7 mm.
Leg III...	6.0	7.8	6.6	2.7	23.1 mm.
Leg IV...	7.5	9.0	8.4	3.3	28.2 mm.

Tibial index of leg I is 7.3, of leg IV, 8.1.

Length of body 10.5 mm.

	Femur.	Patella + Tibia.	Meta-tarsus.	Tarsus.	Total.
Female					
Leg I...	6.3	8.7	5.7	2.4	23.1 mm.
Leg II...	6.3	8.7	6.0	2.4	23.4 mm.
Leg III...	6.0	7.2	5.1	2.1	20.4 mm.
Leg IV...	7.2	8.4	6.3	2.4	24.3 mm.

Tibial index of leg I is 10.2, of leg IV, 10.5.

Length of body 12.6 mm.

It can be readily seen from the tibial indices that while the male of *brevipes* has thinner legs than the female they are of about the same order of thickness as the female of *mira*. Furthermore the length of the first leg is such as to necessitate revision of Bishop's key to the two species. For *brevipes* he gives "first leg without femur and basal joints, shorter than body"; for *mira,* these segments "as long as body." This should be changed to read for *brevipes:* in female, first leg without femur and basal segments shorter than, and in male not more than 1.1 times as long as, body. For *mira:* these segments in female about 1 1/3 times, in male more than twice, the length of body.

Palpus. The tibial apophysis arises somewhat farther distad than in *mira,* and is drawn out to a blunt point. In *mira* the apophysis is truncated and concave on its inner surface. In the specimens of *mira* which I have examined there is much variation in length of the attenuated portion of the distal plate-like structure ("fulcrum" of Comstock ?) overlying the embolus. In none, however, have I seen one in which this is as long as in *brevipes.* This is at the expense of the basal portion of the fulcrum, which is proportionately narrower than in *mira.*

Emerton apparently had only small individuals of *brevipes.* I have several females which average as large as those of *mira.*

Records: Male (allotype), Westville, Conn., summer of 1933 (B. J. K.). Females, South Meriden, Conn., May 30, 1935 (H. L. Johnson) ; and Meriden, Conn., June 9, 1936 (H. L. J.).

ATTIDAE

Euophrys nearctica n. sp. (Figures 25 and 26.)

Female. Total length 3.6 mm. Carapace 1.7 mm. long, widest between 2nd and 3rd coxae, where it is 1.22 mm., and with a maximum height of .9 mm at dorsal eyes. Pars cephalica black and shining. Pars thoracica brown suffused with black. Thoracic groove imperceptible. There are a few hairs scattered about on sides and dorsum, longer around front row of eyes.

Ocular quadrangle slightly less than half the length of carapace. First row of eyes 1.11 mm. long, slightly recurved. Ratio of medians to laterals 25: 15, practically contiguous. Second row midway between first and third. Third row 1.14 mm. long, the eyes almost as large as anterior laterals (13/15).

Height of clypeus 8/25 diameter of AME. Chelicerae vertical, grayish except near fang grooves where they are brown. Fang long and evenly curved. Promargin with two teeth, of which the distal is the larger. Retromargin with one tooth as large as the distal on promargin. Maxillary endites somewhat indented on lateral face, slightly wider distally than at base, and with a thick scopula. Labium broader than long (20: 15) extending not quite to middle of maxillae. Sternum oval, longer than wide (52: 40), broadly truncate in front, with first coxae much farther apart than the width of labium. Like the labium and endites in color, brown suffused with grey. Hind coxae almost contiguous. All coxae yellow.

Legs 4312. Legs II, III and IV mostly yellow to light brown, somewhat darker above than below, covered with fine black hairs. Leg I not much heavier than the others, but darker brown to black, especially the tibia and metatarsus. Trichobothria on tibiae, metatarsi and tarsi.

	Femur.	Patella + Tibia.	Metatarsus.	Tarsus.	Total.
Leg I...	.93	1.11	.41	.39	2.84 mm.
Leg II...	.75	.95	.42	.31	2.43 mm.
Leg III...	.97	1.05	.54	.42	2.98 mm.
Leg IV...	1.19	1.40	.93	.49	4.01 mm.

Tibial index of leg I is 19.7, of leg IV, 14.6.

Spines as follows: Leg I, femur dorsal 1–1–1; tibia ventral 2–2–2; metatarsus ventral 2–2. Leg II same as I, except tibia ventral 0–1r–2. Leg III, femur dorsal 1–1–1, prolateral 1 distal; tibia dorsal 2, ventral 0–1–1, retrolateral 1; metatarsus dorsal 2–2, ventral 2–2. Leg IV, femur dorsal 1–1–1, retrolateral 1 distal; tibia ventral 0–1p–2, prolateral 0–1–1, retrolateral 1–1–1; metatarsus ventral 1p–2, prolateral 2–2, retrolateral 1–1–2.

Abdomen oval, ground color yellow to brown like the legs, with a pattern of gray as shown in figure 25. Venter with three broad gray longitudinal bands irregularly edged. Epigynum, figure 24.

This species resembles *monadnock* Emerton, but can be distinguished from the latter by its smaller size, somewhat thinner legs, different abdominal pattern, and in the possession of a retromarginal cheliceral tooth. Moreover, upon comparing the epigyna one finds that in *monadnock* the ducts run from the anterior border posteriad to the receptacula, while in *nearctica* they run anteriad, as figured.

If one uses the key to genera in the Peckhams' revision of the Attidae of North America (1909, Trans. Wisconsin Acad. Sci., XVI), it will be found that *nearctica* fits almost entirely the characters given for *Sidusa,* p. 378, as *Euophrys* is taken out on the basis of the retromargin of the chelicera lacking a tooth. This of course is misleading, for the numerous European species of this genus, as described for example in the works of Simon, Roewer, and Dahl, all have the single conical tooth. Moreover, *Sidusa* differs from

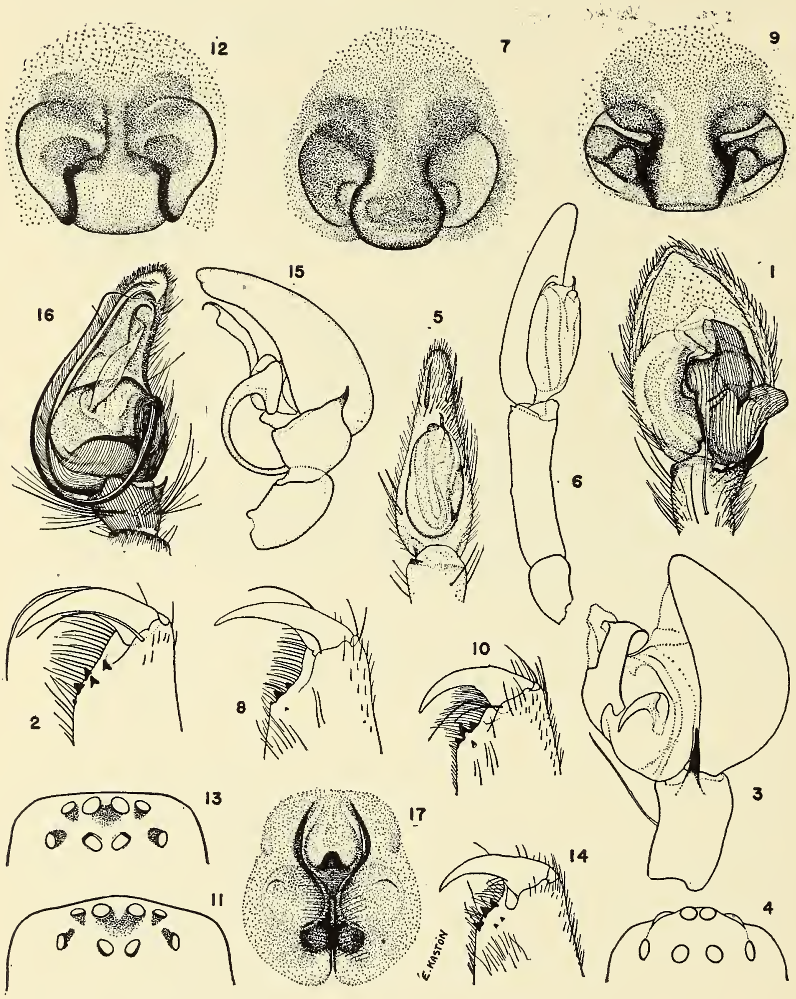
Euophrys in a number of important characters not mentioned by the Peckhams in their key.

Holotype female collected at Old Orchard, Maine, by D. S. Riggs, Aug. 26, 1937.

EXPLANATION OF FIGURES.

PLATE VIII.

Fig. 1. *Rachodrassus monroensis,* male, left palpus, ventral aspect.
2. Idem, distal portion of left chelicera.
3. Idem, left palpus, retrolateral aspect.
4. Idem, eyes from above.
5. *Geodrassus auriculoides,* right palpus, ventral aspect.
6. Idem, retrolateral aspect.
7. Idem, epigynum.
8. Idem, distal portion of left chelicera of male.
9. *Geodrassus phanus,* epigynum.
10. Idem, distal portion of left chelicera of female.
11. Idem, eyes of female, from above.
12. *Drassodes robinsoni,* epigynum.
13. Idem, eyes of female from above.
14. Idem, distal portion of left chelicera of female.
15. *Gnaphosa fontinalis,* left palpus, retrolateral aspect.
16. Idem, ventral aspect.
17. Idem, epigynum.


E. KASTON

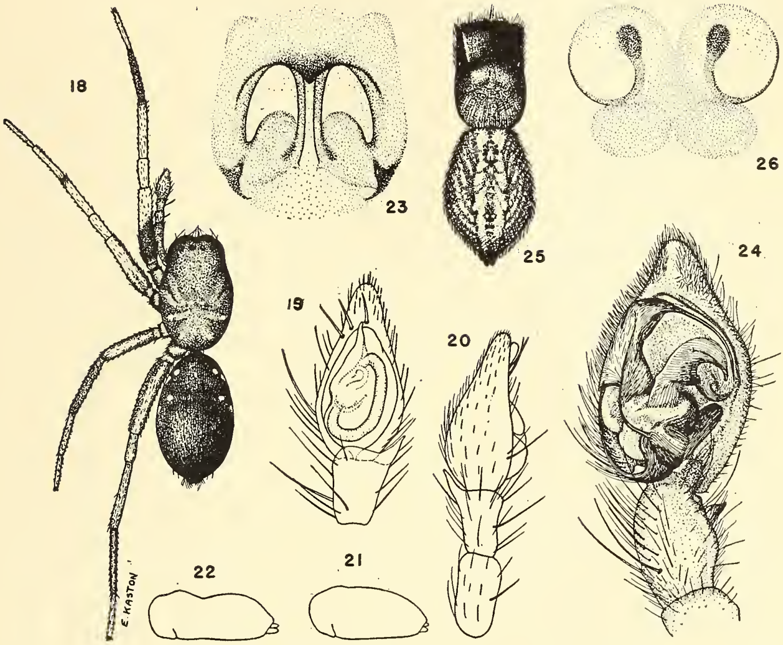


PLATE IX.

18. *Micaria multimaculata,* dorsum of male.
19. Idem, left palpus, ventral aspect.
20. Idem, subdorsal aspect.
21. Idem, left lateral aspect of abdomen.
22. Idem, female, left lateral aspect of abdomen.
23. Idem, epigynum.
24. *Pisaurina brevipes,* left palpus, ventral aspect.
25. *Euophrys nearctica,* dorsum of female.
26. Idem, epigynum.

STENOMACRA MARGINELLA H.-SCH. AND S. CLIENS STAL, A TAXONOMIC NOTE AND A CORRECTION (HETEROPTERA: PYRRHOCORIDAE).

By J. R. de la Torre-Bueno,
Tucson, Ariz.

In this Bulletin (vol. 32, p. 168) I had a biological note on *Stenomacra marginella.* Mr. John C. Lutz, of Philadelphia, kindly has pointed out that this species is really *S. cliens* Stål, and he sent me a male and a female of *marginella* from British Honduras (J. J. White). On rechecking my determination, which had been made according to the figure of the dark phase in Biologia Centrali Americana (Heteroptera I, pl. 20, fig. 23), I find that both Barber (who originally recorded *marginella* from the Huachuca Mountains of Arizona, and later corrected his record to *cliens*) and Mr. Lutz are right. Unfortunately, we have nothing but the original color descriptions of Herrich-Schaeffer and Stål to go by, with a later description of the same character by Fallou (Rev. d'Ent. X: 8), of *Stenomacra sallei,* a straight synonym of *cliens.* None of these authors mentions any structural characters. The dark phase of *cliens* is practically identical with the figure in B. C. A. From the figures in this work, presumably accurate, only *marginella* is shown with basal spines on the anterior femora, those of the figure of *cliens* being unarmed. Examination of specimens of the two species shows this to be inaccurate—in both species the anterior femora are armed. (Incidentally, this is an excellent commentary on figures as an imprescriptible part of a description.)

The superficial differences between the two species are largely of degree, but in addition there are structural differences, as appears from the subjoined brief key. In *S. marginella* the rostrum and the antennae have a more slender appearance than in *cliens. Marginella* has black hemelytra, narrowly bordered costally with orange-yellow; in *cliens,* they are testaceous, with the costal margins paler, verging on ivory-white. In the prothorax of the former, the two posterior spots are velvety black with large, deep black punctures; in the latter, the dark spots are vaguer, slightly darker than the general color in light specimens, fuscescent in the darker. In both, the anterior lobe is smooth, but more raised in *marginella* than in *cliens,* with the lighter margins wider and the light line between the dark spots also wider, but roundedly raised. In *cliens,* the anterior lobe is not so much raised, the light margins are narrower, and the central light line is also narrower and more or less carinate.

In color, *marginella* has decided clean cut contrasts between the black markings and the light colored ones; while in *cliens* the outlines of the markings are vaguer and more suffused.

It is strange to consider that there should be no adequate modern structural description of either species, since the first description of *marginella* by Herrich-Schaeffer in 1850 and of *cliens* by Stål in 1862!

The following brief dichotomy will help separate these two North American species of the genus *Stenomacra*.

Key to Stenomacra cliens and S. marginella

A—Antennal segment I (basal) one and three-sevenths length of II, IV longer than II (40: 35); rostrum extending to, or barely beyond, intermediate coxae; hemelytra black, orange margined; a deep, well-defined groove between anterior and posterior lobes of prothorax, posterior lobe with two nearly square *black* areas, with large, deep, black pits; anterior lobe and narrow area between black patches smooth, rounded, orange colored; head black .... *marginella* H. S.

B—Antennal segment I one and three-fifths II, IV subequal to or slightly shorter than II (32: 34); rostrum extending nearly or quite to posterior coxae; hemelytra testaceous, fuscescent in darker specimens, margined with ivory or pale stramineous; groove between anterior and posterior lobes of the prothorax definite but not very deep, posterior lobe with two nearly square areas, darker than general color in light specimens and fuscous in dark, sparsely pitted with smaller, shallower pits; anterior lobe smooth, as well as *narrow* light-colored area between the dark areas of the posterior lobe; head fuscescent .... *cliens* Stål

THE PRE-COPULATORY BEHAVIOR OF THE MALE OF DOLICHOPUS OMNIVAGUS VAN DUZEE (DIPTERA, DOLICHOPIDAE).

By Geo. Steyskal, Detroit, Mich.

On August 4, 1936, the author succeeded in observing the mating preliminaries of *Dolichopus omnivagus* Van Duzee. The flies were abundant on duckweed (*Lemna* sp.) on the banks of a slow-flowing creek near its junction with the Flint River in Section 5 of North Branch Twp., Lapeer Co., Michigan.

The original description of *D. omnivagus* in U. S. National Museum Bulletin No. 116, p. 216, pl. 11, fig. 156 (1921), fully describes the peculiar modifications of the wings and front legs, the uses of which are here described.

The females were busy searching the water between the duckweed fronds, while the males were engaged in attempting to mate with the females. When a female was found, the male would quickly face her at about his own length before her in the following attitude. Elevated as much as possible on his middle and hind legs, he held his wings in a vertical plane almost at right angles laterally from his body so that the peculiar lobes at the base of the wings were plainly visible from the front. He held his fore legs extended laterally and a little forward, with the tibiae and tarsi hanging downward and forward, displaying the large black pad on the terminal tarsal joint.

He then moved the front tibiae and tarsi sidewise, at the same time dropping the hypopygium a little. Then, a little more quickly, he simultaneously brought the tarsi and hypopygium back to their previous position. This movement was repeated about twice a second. The wings remained motionless.

The female in most cases was apparently unaffected by the display, but continued to examine the water and duckweed. When she turned, the male quickly hopped to a new place in front of her. In a few instances the female remained in one position long enough to allow the male to advance until the black tarsal pads almost touched her eyes. In a few other instances the female moved a little toward the male.

The male several times was seen to attempt quickly to mount the female in the usual dipterous position. This necessitated a very rapid movement in the air to bring himself on her back facing her direction. In all cases, however, the female rapidly moved away. Twice the male, after performing his display for a few seconds, apparently gave up, but soon approached the female from the rear and attempted to mount her. No cases of successful copulation were observed.

Since the pre-copulatory behavior of the males of but very few of the more than 250 North American species of *Dolichopus* is known, an interesting field here awaits the patient observer.

Title Page, Contents and Index for 1938 will be found in the December BULLETIN.

EFFECT OF SUN-LIGHT AND OF LOCATION OF LOGS ON THE BEETLE INFESTATIONS OF ELM LOGS.

Chas. H. Martin,[1] Cornell University, Ithaca, New York.

One of the questions which has constantly recurred during the course of our elm trap-log investigations is whether sun-light has an influence on beetle infestation. In a recent paper on *Hylurgopinus rufipes* (Eich.) life history[2] we came to the tentative conclusion from a series of experiments with logs on horizontal racks in deep shade, medium shade, and without shade, that within the limits occurring in the experiments the amount of light falling upon a log did not have a measurable effect on its *H. rufipes* infestation. On the other hand, a set of similar experiments have been described[3] which indicated that *Scolytus multistriatus* Marsham infestation was influenced by sun-light. In the present paper a second series of experiments are reported in which logs were placed higher above the ground in semi-shade so that they were in more sun-light than the check logs on near-by horizontal racks. These experiments and a clearing experiment again lead to the same conclusions about sun-light. In this paper no attempt is made to study separately heat and light, the term sun-light being used to imply both forms of energy. The experiments also demonstrate a method to increase *Scolytus* infestation over that of the logs on horizontal racks.

Throughout the three years of investigating the habits of the two species there have appeared from time to time sporadic infestations of *H. rufipes* which suggest that the location of a log may be correlated with its infestation. This has been previously reported[4] and further evidence is presented here.

The investigations were made at Patterson, New York.

METHODS.

The experiments may be classified under three heads: (1) ladder racks, (2) suspended logs, and (3) clearing experiment.

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[1] Acknowledgments are due Dr. P. A. Readio and Dr. D. L. Collins for suggestions and manuscript reading.

[2] Martin, Chas. H. 1938. Field notes on the life history of *Hylurgopinus rufipes* (Eich.). Jour. Econ. Ent. (In press.)

[3] Martin, Chas. H. 1936. Preliminary report of trap-log studies on elm bark beetles. Jour. Econ. Ent. 29 (2): 297–306. 1 fig.

[4] *Loc. cit.* 1938.

Ladder racks. The first ladder rack set-up might be called a double ladder-rack or T-rack. It was made by stacking 12 logs from the September 15, 1935, cutting in the form of a letter T, strips of lath being nailed to the ends to keep the logs in position (fig. 1–B).

The rest of the ladder racks were made by nailing two 10-foot poles to the ends of four logs so as to form a ladder-like arrangement (fig. 1–A and 1–C), each log being spaced about a foot and a half from the others. These racks were set upright within 3 feet of the check logs.

Twenty-two ladder racks were set up from August 3, 1936, to August 17, 1937. Three were made from the August, one from the September and one from the November, 1936, cuttings. In 1937 logs for 15 racks were taken from the 8 cuttings made from February 10 to August 17. All of these racks were within 3 feet of the check logs in semi-shade. Also, two racks were put in the sun, one from the June 14 and one from the August 2 cuttings.

Suspended logs. Logs were fastened one foot apart with nails between two ropes and were suspended, by means of block and tackle, 35 to 40 feet above the ground with the long axis of the logs parallel to the ground. One set was placed directly over a horizontal check rack and ladder racks in semi-shade (fig. 1–C), while a second set was suspended near by another horizontal rack which was also in semi-shade. Both sets of suspended logs were in shade a part of the day but for shorter periods than the check logs. Logs for this experiment were cut April 10, May 15, June 14, July 17, and August 2 and 17, 1937. Six to eight logs were suspended at each station from each cutting.

Check logs. The check logs were kept side by side, parallel to the ground, on racks consisting of four posts to which were nailed, three feet above the ground, two long, horizontal poles (fig. 1–A). The racks were 40 yards apart, being in semi-shade.

Both check logs and those for the experiments were 2½ feet long with an average diameter of 5 to 6 inches. The cutting dates were the same as for the experimental logs. Check logs and those for the experiments were obtained from the same trees, usually alternate logs being taken for the experiments.

The data resulting from the ladder rack and suspended log experiments are summarized in fig. 2. In this figure the average infestation of the four logs of each ladder rack and each set of suspended logs, which were infested by 1937 broods of beetles, is contrasted with that of the 10 corresponding check logs.

Clearing experiment. In 1935 and 1936 a series of logs were kept on a horizontal rack in deep shade. The rack was not only shaded by a dense overhead canopy but it was also shaded and shielded from the near-by more open areas by a heavy undergrowth of ironwood, ash, and wild allspice. Logs at this station attracted maximum numbers of *H. rufipes* and but few *S. multistriatus.* During June, 1937, the underbrush was cleared so that the rack could be seen from one of the open areas and also several near-by tall trees were cut down so that sun-light fell on parts of the rack most of the day, whereas previously direct sun-light had reached the rack for only short periods during the day.

RESULTS OF THE EXPERIMENTS.

The Effect of Sun-light on Beetle Infestation.

Ladder racks. Hylurgopinus. None of the *H. rufipes* infestations in the logs of the twenty-two ladder racks significantly exceeded those of the check logs, indicating that sun-light did not influence the infestation of this species. The analysis of the data is as follows:

1936 infestations. The two ladder racks of the August 3 cutting averaged 2.5 and 3.5 *H. rufipes* per log; the check logs averaged 2.4 beetles. None entered the logs of the ladder rack of the August 17 cutting; the check logs averaged one beetle per log.

1937 infestations. From fig. 2 it is evident that the five cuttings made from September 15, 1936, to May 15, 1937, attracted between 90 and 95 per cent of all the *H. rufipes* coming to the logs in 1937. The seven ladder racks of these cuttings averaged 162.6 beetles per log; the check logs averaged 146 beetles. The standard error being 34.25, the difference of 16.6 beetles was not significant.

The six cuttings made from May 30 to August 17 had relatively low *H. rufipes* infestations. The twelve ladder racks of these cuttings averaged 11.2 beetles per log; the check logs averaged 6.7 beetles. The standard error being 3.87, the difference of 4.5 beetles was not significant.

Scolytus. Figure 2 shows that the 1937 *Scolytus* infestation falls into two classes, one where there are no differences between ladder-rack infestations and check logs (a period when infestations were low) and a second class where the ladder-rack infestation is almost double that of the check logs. The first class includes the infestations of logs cut from September 17, 1936, to May 15, 1937, and the second class includes those cut from May 30 to August 17, 1937. In the first class the *H. rufipes* infestation far exceeds that of *S. multistriatus,* while in the second some of the infestations of *H. rufipes* were equal to those of *S. multistriatus* while others were less. The ladder rack infestations of this class exceeds the check logs by an average of 1.9 times. The analysis of the data is as follows:

1936 infestations. The 1936 data for *S. multistriatus* infestation of ladder racks is not presented graphically. The results of the three racks cut in August were: The two ladder racks of the August 3, 1936, cutting averaged 21.3 ± .17 (p. e.) and 24.6 ± .15 beetles per log; the check logs averaged 13.6 ± .50 beetles. The ladder rack of August 17 cutting averaged 18 ± .20 beetles; the check logs averaged 4.4 ± .38 beetles. These data indicate that the ladder racks attracted significantly more beetles than the checks.

1937 infestations. The seven ladder racks of logs cut from September 15, 1936, to May 15, 1937, averaged 1.2 *S. multistriatus* per log; the check logs averaged 3.7 beetles. The standard error being 1.59, the difference of 2.5 beetles was not significant.

The twelve ladder racks set up from May 30 to August 17, 1937, averaged 61.7 *S. multistriatus* per log; the corresponding check logs averaged 31.5 beetles. The standard error being 9.61, the average difference of 30.2 beetles was highly significant.

In addition to this comparison, several others can be made which confirm the conclusion that the additional amount of sun-light on the logs in the ladder racks is the factor responsible for the increased infestation by *S. multistriatus.* The results of the comparisons may be stated as follows:

1. The difference in infestation between the top log and the lowest log in the racks was significant.
2. The differences in infestations between the two middle logs and the top and/or the lowest log of the racks were not significant.
3. The two ladder racks in the sun did not differ significantly in infestation from those of the check logs in the sun.
4. The ladder racks in semi-shade did not differ significantly in infestation from the check logs in the sun.

The ladder racks were under more favorable sun-light conditions than the check logs in semi-shade for two reasons. One was that the logs in the ladder racks had more surface exposed to the light than the check logs, which were partially shaded on each side by adjacent logs. A second advantage was that parts of the ladder racks, at different times of the day, were above many of the shadows that fell on the check logs. This is illustrated in fig. 1–C.

Suspended logs. *Hylurgopinus.* As with the ladder racks, the *H. rufipes* infestation of the suspended logs did not, at any time of the season, differ significantly from the check log infestations.

Scolytus. The *S. multistriatus* infestation of the suspended logs cut from April 10 to June 14, 1937, did not differ from that of the check logs on horizontal racks on the ground. During the peak period of *S. multistriatus,* the suspended logs cut from July 17 to August 17, 1937, averaged 99.5 beetles per log; the check logs averaged 31 beetles per log. The standard error being 14.7, the difference of 68.5 beetles was highly significant.

The ladder rack logs averaged 30.9 more *H. rufipes* per log than the suspended logs. The standard error being 21.6, the difference was not significant. Also, the suspended logs averaged 26 more *S. multistriatus* per log than the ladder racks for the July 17, August 2 and 17 cuttings. The standard error being 18.8, the difference was not significant. The non-significant differences between the suspended logs and ladder racks indicate that both species of beetles will infest logs near the ground as readily as logs 35 to 40 feet above it.

Clearing experiment. The clearing experiment further corroborates the data which show that the sun-light conditions around a log affects its *S. multistriatus* infestation. During 1935 and 1936 the logs at the deep shade station averaged 1.8 *S. multistriatus* per log for cuttings made from June 14 to August 17; for the same period in 1937, after the clearing was done, the logs at this station averaged 13.5 beetles. The standard error being 1.46, the difference of 11.5 beetles was highly significant, indicating that shade was probably the primary factor causing the low infestations of 1935 and 1936.

EFFECT OF LOCATION OF A LOG ON ITS INFESTATION

The placing of a log with reference to its locale seems to have an influence on *H. rufipes* infestation because this species apparently does not travel very far from its hibernating quarters. A corollary would be that the closer the log is to the hibernating quarters the more heavily infested it will become. Such a hypothesis seems to explain the results of previous data as well as the results obtained with the double ladder-rack experiment.

Double ladder rack. In the spring of 1936 the double ladder rack averaged 275 *H. rufipes* per log. The minimum infestation of 51 beetles was in a log next to the ground, while the log with the maximum infestation of 478 beetles rested across one end of the former. The other infestations are given in fig. 1 where the number on each log is its infestation. The log with the minimum infestation had been water-soaked by flood waters just previous to the appearance of *H. rufipes* which accounts for its reduced infestation. Five logs of the same trees, from which the double ladder-rack logs had been taken, were on a horizontal rack in semi-shade 25 yards away. These logs averaged 38 beetles per log, while on the same rack logs of the January 30 cutting averaged 56.5 beetles and logs of the May 15 cutting averaged 36 beetles per log. Other logs from the same trees were at a second station 75 yards from the ladder rack. These logs were not infested but, on the same rack, logs of the January 30 cutting averaged 70.5 beetles and logs of the May 15 cutting averaged 15 beetles per log.

Since similarly heavy infestations were not obtained at the other ladder racks, that of the double ladder rack cannot be ascribed to the arrangement of the logs. The extremely heavy infestation of the double ladder and the relatively light infestations of the other logs at the near-by stations would suggest that the ladder rack was in very close proximity to a large hibernating population of *H. rufipes* while the other logs were not. No explanation has been found for the lack of infestation in the one set of logs of the September 15, 1936, cutting.

CORRELATION OF TIME OF CUTTING WITH INFESTATION

It has been previously shown[5-6] and is again demonstrated by the data in this paper in fig. 2 that the relative density of *H. rufipes* and *S. multistriatus* infestations of a log are correlated with the time of cutting. The largest numbers of *H. rufipes* come to the logs cut during the fall and winter, or spring, previous to the appearance of the late May peak population; the largest numbers of *S. multistriatus* come to logs cut during late July and during August of the same season that infestation occurs.

SUMMARY

Hylurgopinus rufipes (Eich.) and *Scolytus multistriatus* Marsham infestations of logs in a ladder-like arrangement and of logs suspended 35 to 40 feet above the ground did not differ significantly, indicating that both species infest logs near the ground as readily as those high above it. *H. rufipes* infestations of the logs of these two experiments did not differ significantly from those of the check logs which were 3 feet off the ground and in less sun-light

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[5] *Loc. cit.* 1936.

[6] *Loc. cit.* 1938.

than the logs of the experiments, and it was inferred that the *H. rufipes* infestation depends to a greater extent upon the proximity of the log to the hibernating quarters of this species. On the other hand, when *H. rufipes* infestation was low, *S. multistriatus* infestations of the experimental logs did differ significantly from those of the check logs, indicating that an increase in sun-light caused a corresponding increase in the infestation of this species.

The clearing of trees around a deep-shade station so as to increase the amount of sun-light falling on the logs brought about a marked increase in *S. multistriatus* infestation.

EXPLANATION OF PLATES.

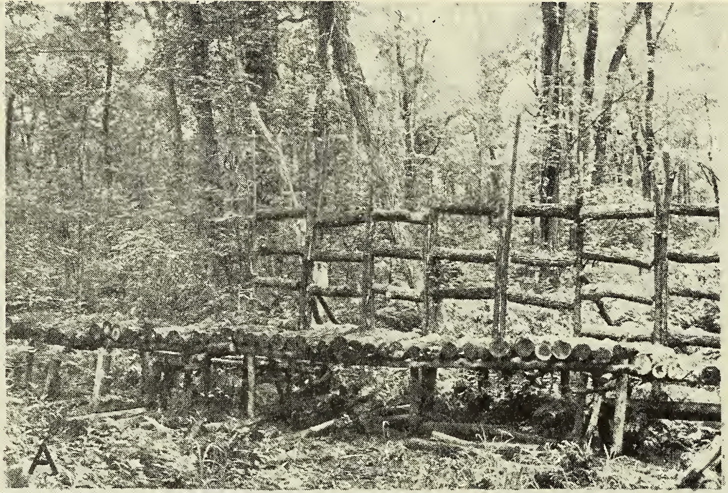
PLATE X.

A. Ladder racks and horizontal check logs.
B. Double ladder rack or T-rack. Numbers show infestation of *Hylurgopinus rufipes*.
C. Suspended logs, ladder racks, and check logs. The logs in the foreground have been stripped. Note the sun-light on the suspended logs and ladder racks while the horizontal check logs are in shade.

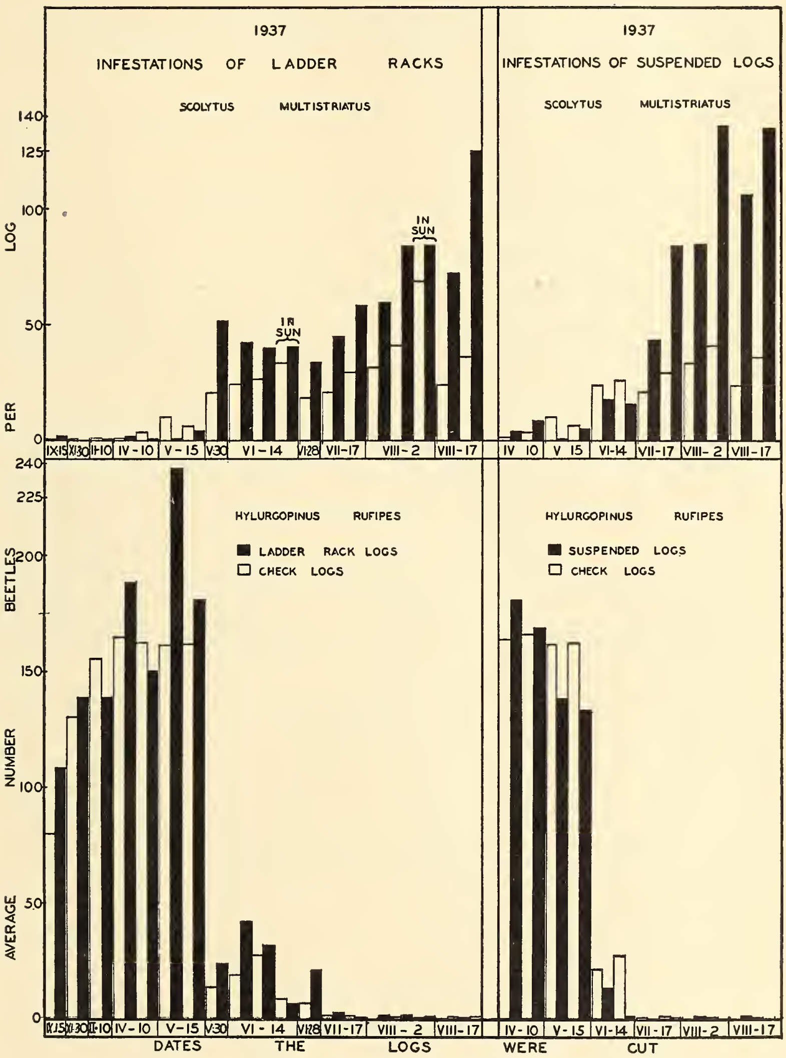
PLATE XI.

Infestation of ladder racks and suspended logs contrasted with the corresponding check logs.

Unusual Pentatomid Records.—*Phimodera torpida* Wlk., St. Ignace, Mackinac Co., Mich., July 24, 1924 (T. H. Hubbell), det. R. F. Hussey. *Rhacognathus americanus* Stål, E. S. George Reserve, Livingston Co., Mich. (near village of Pinckney), May 25, 1933 (G. Steyskal); Midland, Mich., July 16 and 18, 1937 (R. R. Dreisbach). *Solubea pugnax* Fabr., St. Joseph, Berrien Co., Mich., May 31, 1938 (G.. Steyskal). The specimens are in the University of Michigan Museum of Zoology, with the exception of the *Rhacognathus* from Midland, which are in Mr. Dreisbach's collection.—GEO. STEYSKAL, Detroit, Mich.


A

B


1937
INFESTATIONS OF LADDER RACKS
SCOLYTUS MULTISTRIATUS
1937
INFESTATIONS OF SUSPENDED LOGS
SCOLYTUS MULTISTRIATUS
IN SUN
IN SUN
140
125
100
50
0
IX-15
XI-30
II-10
IV-10
V-15
V-30
VI-14
VI-28
VII-17
VIII-2
VIII-17
IV 10
V 15
VI-14
VII-17
VIII-2
VIII-17
240
225
200
150
100
50
0
HYLURGOPINUS RUFIPES
■ LADDER RACK LOGS
☐ CHECK LOGS
HYLURGOPINUS RUFIPES
■ SUSPENDED LOGS
☐ CHECK LOGS
IX-15
XI-30
II-10
IV-10
V-15
V-30
VI-14
VI-28
VII-17
VIII-2
VIII-17
IV-10
V-15
VI-14
VII-17
VIII-2
VIII-17
AVERAGE NUMBER BEETLES PER LOG
DATES THE LOGS WERE CUT

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

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WANTED.—North American CHRYSIDIDAE for exchange or determination, with privilege of retaining duplicates. W. G. Bodenstein, Dept. Entomology, Cornell University, Ithaca, New York.

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LOCALITY LABELS—5 in strip, 1 to 3 lines. 75c per thousand. Pamphlet price list, samples upon request. Any size type. 3½ point, $1.00 per thousand. George F. Michels, Printing—604 Hollenbeck St., Rochester, N. Y.

ACALYPTRATE DIPTERA OF THE WORLD wanted for determination or in exchange for other insects. Geo. Steyskal, 23341 Puritan Ave., Detroit, Mich.

1939

Vol. XXXIII DECEMBER, 1938 No. 5

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JAN 14 1939
NATIONAL MUSEUM

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXXIII December, 1938 No. 5

SEVEN NEW PHLAEOTHRIPIDAE FROM THE UNITED STATES.

By J. Douglas Hood, Cornell University.

The species described in this paper have been known to the writer for a number of years, all of them having been taken in the period between 1914 and 1927, principally by Bert R. Coad, Dr. Alexander Wetmore, and L. O. Jackson. The types are in the author's collection.

Leptothrips oribates sp. nov.

Female (macropterous).—Length about 1.9 mm. (fully distended, 2.4 mm.). Color dark brown or blackish brown, with abundant purple pigmentation, the tarsi a trifle lighter; antennae with segments I, II, and VI-VIII almost concolorous with body, I paler basally, II yellowish in median apical portion and narrowly nearly black at sides and across base, III lemon yellow and more or less clouded with brown in apical third, IV yellow in about basal two-fifths and dark brown in about apical two-fifths, often with pedicel somewhat shaded, V yellow in about basal third, shading to dark brown in apical half or more and with its pedicel shaded, VI sometimes yellowish just beyond pedicel; fore wings clear, with base of scale and a small area behind first subbasal seta dark brown.

Head scarcely 1.6 times as long as greatest width across cheeks, which is behind their middle, the width across eyes very slightly less; cheeks distinctly notched at posterior angles of eyes, rounded, and narrowing to a very slight basal collar, the least width near base about 0.9 that across eyes; vertex roundly produced as usual, overhanging, and bearing the forwardly-directed median ocellus at its extremity; surface of head rather deeply cross-striate; postocular setae slender, brown, with pointed tips, their length about 37 μ, interval

JAN 13 1939

109 μ, distance from eyes 19 μ. Eyes typical, somewhat protruding, not at all produced ventrally, measuring in μ as follows in one NaOH-treated paratype: dorsal length 80, dorsal width 51, dorsal interval 57, ventral length 83, ventral width 46, ventral interval 67. Antennae normal. Mouth-cone typical, extending about 120 μ beyond posterior dorsal margin of head.

Prothorax about 0.6 the length of head, its dorsal surface distinctly cross-striate over most of its area; major setae dark brown, scarcely pointed, the antero-marginals 37 μ, antero-angulars 27 μ, midlaterals minute, epimerals 50 μ, postero-marginals 42 μ, coxals pointed, 13 μ. Pterothorax normal; meso- and metanota with the usual fine striations. Legs normal. Fore wings typical, about 1.0 mm. long, with 6 or 7 accessory setae, the subbasal setae all colorless, I and II with dilated tips and respectively about 43 and 45 μ long, III pointed and about 60 μ.

Abdomen typical, broadest at segment III; setae on segments I-IV and the terminal ones largely brown, all others nearly colorless apically, those on the first two or three segments blunt, all others pointed, the three major pairs on IX respectively 140, 142, and 93 μ; tube (segment X, only) scarcely one-half as long as head, hardly twice as long as greatest subbasal width, and nearly twice as wide near base as at apex, its sides slightly concave.

Measurements of female (mostly of holotype), in mm.: Length about 1.87 (fully distended, 2.38); head, length 0.260, width across eyes 0.158, least width at posterior margin of eyes 0.154, greatest width across cheeks 0.166, least width near base 0.147; prothorax, median length of pronotum 0.118, width (inclusive of coxae) 0.265; mesothorax, width across anterior angles 0.318; abdomen, greatest width (at segment III) 0.357; tube (segment X, only), length 0.138, greatest subbasal width 0.071, least apical width 0.040; terminal setae, length 0.156.

Antennal segments*:	1	2	3	4	5	6	7	8
Length (μ):	40	54	64	65	56	51	45	34
Width (μ):	32	29	26	32	30	27	23	16

Total length of antenna 0.409 mm.

Male (macropterous).—Identical with female in color, but with head, antennae, and abdomen more slender; allotype with head 240 μ, width across eyes 151, least width at posterior margin of eyes 140, greatest width across cheeks 153, least width near base 136.

---

* The measurements which follow are of a topotypic paratype.

COLORADO: Boulder (Kosslers Lake, 7500 ft.), July 12, 1924, L. O. Jackson, 2 ♀♀ (including holotype), on *Pinus scopulorum;* Boulder, June 14, 1924, L. O. J., 4 ♀♀, in miscellaneous collecting; Boulder (Gregory Canyon), June 21, 1924, L. O. J., 6 ♀♀, on *Pinus scopulorum.*

ARIZONA: Williams, July 10, 1918, Alexander Wetmore, 3 ♀♀ and 1 ♂ (the last being the allotype), on *Pinus brachyptera.*

NEW MEXICO: Chusca Mts., July 1, 1918, Alexander Wetmore, 4 ♀♀ and 1 ♂, on *Pinus brachyptera.*

This species is closely allied to *L. mali* (Fitch), but differs conspicuously in that the eyes are not prolonged posteriorly on the ventral surface of the head.

Leptothrips larreae sp. nov.

Female (macropterous.)—Length about 1.9 mm. (fully distended, 2.4 mm.). Color dark brown or blackish brown, with abundant purple pigmentation, the tarsi sometimes a trifle lighter; antennae with segments I, II, and V–VIII almost concolorous with body, I paler basally, II yellowish in median apical portion and narrowly nearly black at sides and across base, III golden yellow in basal third and shading to dark brown in apical third, IV golden yellow in basal third and with its remainder dark brown, often with pedicel somewhat shaded, V sometimes indistinctly yellowish just beyond pedicel; fore wings clear, with base of scale and a small area behind first subbasal seta dark brown.

Head about 1.4 times as long as greatest width across cheeks, which is behind their middle, the width across eyes very slightly less; cheeks slightly notched at posterior angles of eyes, rounded, and narrowing to a very slight basal collar, the least width near base about 0.9 that across eyes; vertex roundly produced as usual, overhanging, and bearing the forwardly-directed median ocellus at its extremity; surface of head rather deeply cross-striate; postocular setae slender, brown, with pointed tips, their length about 33 μ, interval 122 μ, distance from eyes 12 μ. Eyes typical, somewhat protruding, distinctly produced ventrally, and measuring in μ as follows in one NaOH-treated paratype: dorsal length 75, dorsal width 51, dorsal interval 63, ventral length 91, ventral width 53, ventral interval 60. Antennae normal in general structure; segment III short, subequal in length to II; sense-cone formula: III 0–1, IV 1–2, V and VI 1–1^{+1}, VII 1 dorsal. Mouth-cone typical, extending about 108 μ beyond posterior dorsal margin of head.

Prothorax scarcely 0.5 the length of head, its dorsal surface rather heavily cross-striate throughout; major setae dark brown, truncate at tip, the antero-marginals 25 μ, antero-angulars 15 μ, midlaterals and coxals minute, epimerals 53 μ, postero-marginals 35 μ. Pterothorax normal; meso- and metanota with the usual fine striations. Legs normal. Fore wings typical, about 0.9 mm. long, with 3–6 accessory setae, the subbasal setae all colorless, I and II with dilated tips and respectively about 30 and 38 μ long, III pointed and about 40 μ.

Abdomen typical, broadest at segment III; setae on segments I–IV and the terminal ones largely brown, the others nearly colorless, all of them pointed or nearly so, the three major pairs on segment IX of holotype respectively 137, 124, and 100 μ; tube (segment X, only) about one-half the length of head, hardly twice as long as greatest subbasal width, and nearly twice as wide near base as at apex, its sides almost perfectly straight.

Measurements of female (mostly of holotype), in mm.: Length about 1.88 (fully distended, 2.39); head, length 0.246, width across eyes 0.165, least width at posterior margin of eyes 0.161, greatest width across cheeks 0.172, least width near base 0.153; prothorax, median length of pronotum 0.117, width (inclusive of coxae) 0.273; mesothorax, width across anterior angles 0.308; abdomen, greatest width (at segment III) 0.353; tube (segment X, only), length 0.120, greatest subbasal width 0.064, least apical width 0.036; terminal setae, length 0.122.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ):	38	56	57	60	54	50	41	32
Width (μ):	34	29	23	31	30	27	23	16

Total length of antenna 0.388 mm.

Male (macropterous).—Identical with female in color, but with head, antennae, and abdomen more slender; allotype with head 230 μ, width across eyes 150 μ, least width at posterior margin of eyes 146 μ, greatest width across cheeks 160 μ, least width near base 141 μ.

ARIZONA: Tucson, April 24, 1914, Bert R. Coad, 4 ♀♀ and 2 ♂♂ (including holotype and allotype) [Hood No. 226]; Quijotoa, August 28, 1927, J. D. H., 9 ♀♀ and 1 ♂ [Hood No. 899].

CALIFORNIA: Victorville, August 15, 1927, J. D. H., 8 ♀♀ and 4 ♂♂ [Hood No. 813].

All of the material listed above was taken on Greasewood or Creosote Bush (*Larrea tridentata* DC. = *Covillea glutinosa* Jeps.; det. by Dr. Paul C. Standley and Dr. Philip A. Munz). The principal diagnostic characters of this species are (1) the short, broad head, (2) the ventrally prolonged eyes, (3) the short third antennal segment, in comparison with the second, and (4) the distinctly striate pronotum.

Leptothrips papago sp. nov.

Female (macropterous).—Length about 2.1 mm. (fully distended, 2.7 mm.). Color dark brown or blackish brown, with abundant purplish pigmentation, the tarsi scarcely lighter; antennae with segment I, II, and VI–VIII almost concolorous with body, II pale yellow across apex and narrowly nearly black along inner surface and across base, III pale yellow, IV and V yellow in about basal third and brown beyond, V darker than IV; fore wings clear, with base of scale and a small area behind first subbasal seta dark brown.

Head about, 1.7 times as long as greatest width across cheeks, which is behind their middle, the width across eyes slightly less; cheeks slightly notched at posterior angles of eyes, rounded, and narrowing to a very slight basal collar, the least width near base only slightly less than that across eyes; vertex roundly produced as usual, overhanging, and bearing the forwardly-directed median ocellus at its extremity; surface of head rather deeply and closely cross-striate; postocular setae slender, brown, with pale blunt tips, their length about 46 μ, interval 118 μ, distance from eyes 23 μ. Eyes typical in general structure, distinctly protruding, scarcely produced ventrally, and measuring in μ as follows in the holotype: dorsal length 95, dorsal width approximately 58, dorsal interval about 52, ventral length 102. Antennae normal in general structure, but with segments V–VIII relatively short and stout, VI only 0.64 as long as IV; sense-cone formula: III 0–1, IV 1–2, V and VI 1–1^{+1}, VII 1 dorsal. Mouth-cone typical, extending about 117 μ beyond posterior dorsal margin of head.

Prothorax about 0.44 the length of head, its dorsal surface rather heavily and closely cross-striate throughout; major setae dark brown, truncate at tip, the antero-marginals 29 μ, antero-angulars 25 μ, midlaterals and coxals minute, epimerals 54 μ, postero-marginals 48 μ. Pterothorax normal; meso- and metanota with the usual fine striations. Legs normal. Fore wings typical, about 1.0 mm. long, without accessory setae, the subbasal setae all colorless, I and II with dilated tips and respectively about 39 and 43 μ long, III pointed and about 55 μ.

Abdomen typical, broadest at segment II; major setae on segments I–V brown with pale tips, the dorso-lateral series somewhat dilated, the others blunt; setae on segments VI–IX successively paler, brown at base and nearly colorless apically, the lateral series pointed or nearly so, the dorso-lateral series slightly dilated or blunt; segment IX with the three major pairs pointed and respectively 130, 124, and 80 μ in holotype; tube (segment X, only) about 0.42 the length of head, twice as long as greatest subbasal width, and 1.7 times as wide near base as at apex, its sides almost perfectly straight.

Measurements of female (holotype), in mm.: Length about 2.12 (fully distended, 2.66); head, length 0.300, width across eyes 0.168, least width at posterior margin of eyes 0.157, greatest width across cheeks 0.178, least width near base 0.165; prothorax, median length of pronotum 0.133, width (inclusive of coxae) 0.298; mesothorax, width across anterior angles approximately 0.344; abdomen, greatest width (at segment II) 0.372; tube (segment X, only), length 0.127, greatest subbasal width 0.064, least apical width 0.038; terminal setae, length 0.131.

Antennal segments:	1	2	3	4	5	6	7	8	
Length (μ):	40	60	70	75	53	45	43	29	(holotype)
	41	55	71	68	53	46	43	29	(paratype)
Width (μ):	36	29	26	33	31	26	23	16	(holotype)

Total length of antenna (holotype) 0.415 mm.

Male (macropterous).—Identical with female in color, but with head, antennae, and abdomen more slender; allotype with head 256 μ long, width across eyes 145 μ, least width at posterior margin of eyes only 128 μ, greatest width across cheeks only 144 μ, least width near base 131 μ.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ):	36	54	64	69	58	50	47	30
Width (μ):	30	25	23	28	27	23	19	14

Total length of antenna 0.408 mm.

ARIZONA: Tucson, April 23, 1914, Bert R. Coad, 4 ♀♀ and 1 ♂, from cottonwood [Hood No. 221].

The principal diagnostic characters of this species, which is somewhat larger than most of its congeners, are (1) the long head, (2) scarcely produced eyes, (3) long third and fourth antennal segments and short fifth to eighth, the sixth being only 0.64 the length of the fourth, (4) closely but deeply striate pronotum, and (5) absence of accessory wing setae.

Leptothrips acaciae sp. nov.

Female (macropterous).—Length about 1.7 mm. (fully distended, 2.2 mm.). Color dark brown or blackish brown, with abundant purple pigmentation, the tarsi scarcely lighter; antennae with segments I and II almost concolorous with body, II light brown medially and apically and narrowly nearly black along both inner and outer surfaces and across base, III golden yellow, more or less overlain with gray, especially apically, IV and V brown, V darker than IV, both somewhat paler beyond pedicel, VI–VIII uniform blackish brown; fore wings clear, with base of scale and a small area behind first subbasal seta dark brown.

Head about 1.5 times as long as greatest width across cheeks, which is near their middle, the width across eyes slightly less; cheeks slightly notched at posterior angles of eyes, rounded, and narrowing to a very slight basal collar, the least width near base only slightly less than that across eyes; vertex roundly produced as usual, overhanging, and bearing the forwardly-directed median ocellus at its extremity; surface of head rather deeply and closely cross-striate; postocular setae slender, brown, with pale dilated tips, their length about 25 μ, interval 107 μ, distance from eyes 14 μ. Eyes typical in general structure, somewhat protruding, distinctly produced ventrally, and measuring in μ as follows in a topotypic paratype: dorsal length 80, dorsal width 49, dorsal interval 51, ventral length 95, ventral width 47, ventral interval 55. Antennae normal in general structure, but with the segments all relatively short and stout; VI about 0.8 as long as IV; sense-cone formula: III 0–1, IV 1–2, V and VI 1–1^{+1}, VII 1 dorsal. Mouth-cone typical, extending about 112 μ beyond posterior dorsal margin of head.

Prothorax about 0.46 the length of head, its dorsal surface heavily and closely cross-striate throughout; major setae dark brown, slightly dilated at tip, the antero-marginals 26 μ, antero-angulars, midlaterals, and coxals minute, epimerals 40–52 μ, postero-marginals 33–38 μ. Pterothorax normal; meso- and metanota with the usual fine striations. Legs normal. Fore wings typical, about 0.83 mm. long, without accessory setae, the subbasal setae all colorless, I and II with dilated tips and respectively about 28 and 33 μ long, III pointed and about 58 μ.

Abdomen typical, broadest at segment III; major setae on segments I–VI brown with pale tips, the dorso-lateral series somewhat dilated, the others blunt; setae on segments VII–IX pale brownish yellow, the lateral pair on VII pointed or nearly so, the others blunt; segment IX with the three major pairs pointed and respectively 120, 107, and 86 μ in holotype; tube (segment X, only) about 0.44 the length of head, 1.7 times as long as greatest subbasal width, and 1.7 times as wide near base as at apex, its sides almost perfectly straight.

Measurements of female (holotype), in mm.: Length about 1.66 (fully distended, 2.15); head, length 0.242, width across eyes 0.150, least width at posterior margin of eyes 0.143, greatest width across cheeks 0.158, least width near base 0.143; prothorax, median length of pronotum 0.112, width (inclusive of coxae) 0.249; mesothorax, width across anterior angles 0.266; abdomen, greatest width (at segment III), 0.300; tube (segment X, only), length 0.106, greatest subbasal width 0.063, least apical width 0.036; terminal setae, length 0.115.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ):	35	52	54	53	44	43	37	24
Width (μ):	31	27	23	30	28	26	23	15

Total length of antenna 0.342 mm.

Male (macropterous).—Identical with female in color, but with head, antennae, and abdomen more slender; allotype with head 237 μ long, width across eyes 138 μ, least width at posterior margin of eyes 128 μ, greatest width across cheeks 137 μ, least width near base 115 μ.

ARIZONA: Wickenburg, August 25, 1927, J. D. H., 7 ♀♀ (including holotype) and 1 ♂ (allotype), on *Acacia Greggii* [Hood No. 878]; Nogales, August 30, 1927, J. D. H., 10 ♀♀, on *Acacia* or *Prosopis* [Hood No. 909].

This little species agrees with *papago* in lacking accessory wing setae, but differs from it markedly in the shorter head, the produced eyes, and the shorter and stouter antennae, with their sixth segment about 0.8, instead of 0.64, the length of the fourth.

Leptothrips oregonensis sp. nov.

Female (macropterous).—Length about 1.8 mm. (fully distended, 2.3 mm.). Color dark brown or blackish brown, with abundant purple pigmentation, the tarsi yellowish brown; antennae with segments I and II almost concolorous with body, I paler across base, II light brown medially and apically and narrowly nearly black along inner surface and across base, III yellow and lightly shaded with brown apically, IV and V yellowish brown, V darker than IV, both somewhat paler beyond pedicel and darker apically, VI–VIII brown, VII darker than VI; fore wings clear, with base of scale and a small area behind first subbasal seta dark brown.

Head about 1.5 times as long as greatest width across cheeks, which is behind their middle, the width across eyes distinctly less; cheeks slightly notched at posterior angles of eyes, rounded, and narrowing to a very slight basal collar, the least width near base less than that across eyes; vertex roundly produced as usual, overhanging, and bearing the forwardly-directed median ocellus at its extremity; surface of head rather lightly and closely cross-striate; postocular setae slender, pale, and pointed, their length about 37 μ, interval 113 μ. Eyes typical in general structure, somewhat protruding, slightly shorter ventrally, and measuring as follows, in μ, in the holotype: dorsal length 83, dorsal width 50, dorsal interval 57, ventral length 76, ventral width approximately 45, ventral interval about 67. Antennae normal in general structure; segment VI about 0.8 as long as IV; sense cone formula: III 0–1, IV 2–2, V and VI 1–1^{+1}, VII 1 dorsal. Mouth-cone typical.

Prothorax about 0.47 the length of head, its dorsal surface almost without striae; major setae dark brown, the antero-marginals and antero-angulars pointed and respectively 27 and 20 μ, the midlaterals and coxals minute, epimerals and postero-marginals blunt at apex and respectively 53 and 40 μ. Pterothorax normal; meso- and metanota with the usual fine striations. Legs normal. Fore wings typical, about 0.88 mm. long, with 6–8 accessory setae, the subbasal setae all colorless, I and II with dilated tips and respectively about 33 and 37 μ long, III pointed and about 52 μ.

Abdomen typical, broadest at segment III; major setae pointed, those on segments I–V and the terminal ones brown, those on VI–IX nearly colorless, IX with the three major pairs respectively 145, 153, and 112 μ in holotype; tube (segment X, only), about one-half the length of head, 1.7 times as long as greatest subbasal width, and about twice as wide near base as at apex, its sides slightly concave.

Measurements of female (holotype), in mm.: Length about 1.82 (fully distended, 2.25); head, length 0.245, width across eyes 0.156, least width at posterior margin of eyes 0.152, greatest width across cheeks 0.166, least width near base 0.148; prothorax, median length of pronotum 0.116, width (inclusive of coxae) 0.262; mesothorax, width across anterior angles 0.302; abdomen, greatest width (at segment III) 0.347; tube (segment X, only), length 0.120, greatest subbasal width 0.069, least apical width 0.036; terminal setae, length 0.160.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ):	35	54	59	60	54	53	46	31
Width (μ):	33	28	26	32	29	26	22	14

Total length of antenna 0.392 mm.

OREGON: Crater Lake National Park, July 21, 1927, J. D. H., 2 ♀♀ (including holotype) on *Ribes cereum* [Hood No. 681], and 1 ♀ under bark on a stump, probably spruce [Hood No. 677].

Readily known from *mali* and the several species described in this paper by the smooth pronotum.

Karnyothrips arizona sp. nov.

Female (brachypterous).—Length about 1.2 mm. (fully distended 1.7 mm.). Color nearly uniform blackish brown; legs about concolorous with body, with all tarsi yellow and tips of all tibiae yellowish; antennae with segments I and II dark brown, I paler across base, II paler in median apical portion and with inner and outer surfaces and base nearly black; III–VIII nearly uniform dark brown, III with pedicel yellow, IV and V nearly black at extreme base; internal pigmentation vermilion red.

Head about 1.3 times as long as greatest width (which is slightly in advance of middle of cheeks), without the slight postocular constriction present in some species; cheeks rounded, slightly narrowed to eyes and to the slight basal collar; dorsal surface smooth and shining, free of sculpture save for two or three lateral striae just in front of the usual subbasal line; vertex not produced and not overhanging; postocular setae nearly colorless, broadly expanded and minutely divided at tip, their length about 34 μ, interval 96 μ, distance from eyes 16 μ. Eyes not protruding and thus evenly rounded with curve of head, about 46 μ long dorsally, their width approximately 30 μ, interval about 50 μ. Ocelli 8–10 μ in diameter, the posterior pair 31 μ apart and 20 μ from median ocellus. Antennae typical in fundamental structure, but unusual in that the more basal segments are shortened (III being only 0.75 as long as VI) and in that IV–VII are almost without pedicels; VIII somewhat narrowed basally but broadly attached to VII; sense-cones slender and very inconspicuous, arranged as follows on inner (and outer) surfaces of segments: III 0 (1), IV 1 (1), V 1 (1^{+1}), VI 1 (1^{+1}), VII 1 dorsal. Mouth-cone typical, extending about 70 μ beyond posterior dorsal margin of head.

Prothorax with median length of pronotum about 0.65 that of head and contained in the trans-coxal width about 2.1 times, with short median thickening near middle; surface perfectly smooth save for one or two partial cross-striae along posterior margin; antero-marginal setae very minute and pointed, the others pale yellowish, with their tips broadly dilated and minutely divided, epimerals 38 μ, coxals 20 μ, the others 32–33 μ. Pterothorax distinctly narrower than prothorax. Legs typical; fore femora slightly enlarged.

Abdomen of normal form and structure, wider than prothorax, its major setae (except for the terminal ones, which are brown at base and pointed) nearly colorless and similar in structure to those on prothorax, save only the pointed wing-retaining ones, the pointed lateral pair on VII, and the pointed setae II and III on IX; IX with seta I 55 μ, II 81 μ, III 63 μ; terminal setae about 97 μ; tube 0.47 the length of head and only 1.3 times as long as greatest subbasal width, which is scarcely twice the apical width, sides nearly straight except at base.

Measurements of female (holotype), in mm.: Length about 1.23 (fully distended, 1.66); head, length 0.155, width across eyes 0.109, greatest width across cheeks 0.119, least width near base 0.114, width across basal collar 0.116; prothorax, median length of pronotum 0.100, width (inclusive of coxae) 0.216; mesothorax, width across anterior angles 0.207; abdomen, greatest width 0.263; tube (segment X, only), length 0.073, greatest subbasal width 0.056, least apical width 0.030.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ):	24	38	30	34	38	40	34	27
Width (μ):	30	24	22	24	23	21	18	12

Total length of antenna 0.265 mm.

ARIZONA: Nogales, August 30, 1927, J.D.H., 1 ♀, from a mesquite-like tree (*Acacia* or *Prosopis*) [Hood No. 909].

The form of the third to seventh antennal segments is very different from that of the other species of *Karnyothrips*. This species is evidently related to *K. longiceps* (Hood), but differs from it in a number of further particulars, such as the shorter tube, the presence of only one sense-cone on the outer surface of the fourth antennal segment, and in the shorter median pair of setae on the ninth abdominal segment.

Karnyothrips arenicola sp. nov.

Female (brachypterous).—Length about 1.5 mm. (fully distended 2.0 mm.). Color nearly uniform ochraceous yellow; legs concolorous with body, save only the blackish brown tarsal cups; antennae with segments I–III about concolorous with body, III slightly paler than the others, IV–VIII nearly uniform light brown, IV often somewhat paler than V, especially basally; ocellar pigmentation red.

Head about 1.4 times as long as greatest width (which is near middle of cheeks), and with a very distinct postocular constriction; cheeks rounded to eyes and to base; dorsal surface smooth and shining, free of sculpture save for about two very faint lateral striae just in front of the usual subbasal line; vertex not produced and not overhanging; postocular setae nearly colorless, pointed, their length about 37 μ, interval 106 μ, distance from eyes 19 μ. Eyes rather strongly protruding and thus not evenly rounded with curve of head, about 49 μ long dorsally, their width approximately 26 μ, interval about 69 μ, ventral length 49 μ, ventral width 21 μ, ventral interval 79 μ. Ocelli wanting. Antennae much as in *K. pallidus* (Hood); segment II longest (51 μ), broadened apically (31 μ), relatively broad at base (19 μ), and constricted at basal fifth (11 μ), with the circular sensory area situated just beyond a line marking off the distal third of the segment; III small, formed as in *pallidus;* IV–VII scarcely pedicellate; VIII somewhat narrowed basally but broadly attached to VII; sense-cones slender and very inconspicuous, arranged as follows on inner (and outer) surfaces of segments: III 0 (1), IV 1 (2), V 1 (1^{+1}), VI 1 (0^{+1}), VII 1 dorsal. Mouth-cone typical, extending about 80 μ beyond posterior dorsal margin of head.

Prothorax with median length of pronotum about 0.77 that of head and contained in the trans-coxal width about 1.65 times, without median thickening, surface perfectly smooth; antero-marginal and midlateral setae very minute (6–8 μ), the others nearly colorless and pointed, antero-angulars 13 μ, epimerals 35 μ, postero-marginals 26 μ, coxals 19 μ. Pterothorax distinctly narrower than prothorax. Legs typical; fore femora slightly enlarged.

Abdomen of normal form and structure, wider than prothorax, its major setae (except for the terminal ones, which are yellowish brown) nearly colorless, all of them pointed; segment IX with setae I and II usually about 120 μ, III about 97 μ; terminal setae about 127 μ; tube one-half the length of head and 1.5 times as long as greatest subbasal width, which is scarcely twice the apical width, sides nearly straight.

Measurements of female (holotype), in mm.: Length about 1.53 (fully distended, 1.95); head, length 0.181, width across eyes 0.117, least width just behind eyes 0.111, greatest width across cheeks 0.127, least width near base 0.119; prothorax, median length of pronotum 0.140, width (inclusive of coxae) about 0.231, mesothorax, width across anterior angles 0.195; abdomen, greatest width (at segment IV) 0.270; tube (segment X, only), length 0.090, greatest subbasal width 0.058, least apical width 0.030.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ):	40	51	39	45	43	40	39	27
Width (μ):	37	31	25	27	25	23	19	11

Total length of antenna 0.324 mm.

Male (brachypterous).—Nearly identical with female in color and structure; sternum VIII with the glandular area in the form of a narrow, nearly complete, transverse band which is divided and hence Y-shaped at either end, the space between the arms of the Y occupied by the ventral attachment of the tergo-sternal muscles.

Measurements of male (allotype), in mm.: Length about 1.24 (fully distended, 1.49); head, length 0.168, width across eyes 0.107, least width just behind eyes 0.100, greatest width across cheeks 0.114, least width near base 0.108, mouth-cone, length beyond posterior dorsal margin of head 0.080, prothorax, median length of pronotum 0.123, width (inclusive of coxae) 0.210; mesothorax, width across anterior angles 0.186; abdomen, greatest width (at segment IV) 0.234; tube (segment X, only), length 0.083, greatest subbasal width 0.054, least apical width 0.029; terminal setae, length 0.110.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ):	37	48	38	44	41	37	38	26
Width (μ):	34	28	23	25	23	20	17	11

Total length of antenna 0.309 mm.

ARIZONA: Aguila, August 22, 1927, J. D. H., 11 ♀♀ and 5 ♂♂, from a grass [*Hilaria rigida* (Thurb.) Benth., det. by Dr. Paul C. Standley]. [Hood No. 850].

The structure of the second and third antennal segments and the color of the body is almost precisely that of *K. pallidus* (Hood). The lack of distinct pedicels on the fourth to seventh segments of the antennae, the pointed body setae, and the form of the glandular area on the eighth abdominal sternum of the male, should serve, however, for the separation of *arenicola.*

Mesoveloidea williamsi Hungerford—A note on its distribution.—This curious insect was described as a new genus and new species from two damaged females taken by F. X. Williams, at Mera, Ecuador, February 3, 1923. (Bull. Brooklyn Ent. Soc. XXIV, p. 289, 1929). Later Dr. T. Jaczewski described the male from three specimens belonging to the U.S.N.M. and taken at Cachali, Ecuador, by Rosenberg. (Proc. Ent. Soc. Wash., XXXIII, pp. 64–65).

That it occurs over a wider range than Ecuador is indicated by the following specimens in the Francis Huntington Snow Collection at the University of Kansas: 1 female labeled "Rio Virilla, Costa Rica, C. A., Dec. 26, 1931. Heinrich Schmidt"; 1 female, Peru, S. A., Oct. 10, 1935, F. Woytkowski, Vicinity Sani Beni, 840 m.a.s.l., canal supplying drinking water; 1 female, Peru, S. A., Dec. 11, 1937, F. Woytkowski, Dept. Huanuco, Vicinity Leonpampa, Jungle 800 m.a.s.l., Forest Pool. Thus the species is distributed from Costa Rica, Central America to Peru, South America. —H. B. Hungerford, Lawrence, Kansas.

ON TWO NEW SPECIES OF PROTURA FROM IOWA, U. S. A.

By H. Womersley, F.R.E.S., A.L.S.
Entomologist, South Australian Museum.

Several years ago, Prof. H. B. Mills of the Iowa State College, Iowa, U. S. A., kindly sent me a small collection of Portura from that State for study. Unfortunately, owing to pressure of other work, I have only recently been able to deal with this material.

Two species, described in this paper, are contained in the collection, one a representative of the genus *Proturentomon* Silv. 1909, (*Paraentomon* Wom. 1927), a genus not previously recorded from America; the other, a species of *Eosentomon,* of which 4 species have been described by Ewing and one by Silvestri, from the United States. These earlier descriptions, however, are extremely inadequate and, before other material can be compared, it is urgently necessary that the original specimens and fresh ones from the same localities should be re-examined.

Family ACERENTOMIDAE Berlese 1909

Subfamily **Proturentominae** nom. nov.

syn. = *Meroentominae* Womersley, E.M.M. *63* 145, 1927.
Protentominae Mills, Bull. Brooklyn Ent. Soc. *27* (2), 129, 1932.

Mills, in his paper (loc. cit.), showed that my change of the generic name *Protentomon* Ewing to *Meroentomon* was not required as the earlier use of *Protentomon* by Mayer (*vide* Imms' Textbook of Entomology) was not in a generic sense but for a purely hypothetical insect; he therefore restored *Protentomon* and substituted the subfamily name *Protentominae* for *Meroentominae.*

Recently, however, Bagnall (Annals Mag. Nat. Hist. *17* (10) 1936, 210–212) has shown, (as I suggested in 1927 might be the case), that Berlese's *Acerentulus minimus* is a member of this subfamily, and that it was designated the type of a new genus *Proturentomon* by Silvestri in 1909. It therefore follows that this is the type genus of the subfamily which must assume the name *Proturentominae.*

In the same paper Bagnall considered my species *Paraentomon clevedonense,* from England, to be synonomous with *minimus,* but with this I cannot agree, for, as is shown in the following key, there are definite differences between the species which have to be placed under *Proturentomon.* Further, owing to the inadequacy of

Ewing's description of *Protentomon transitans,* he (Bagnall) would also synonymize this genus with my *Meroentomon* (*Protentomon*), as well as with *Paraentomon,* and all three with *Proturentomon.* Granting the inadequacy of Ewing's description I still consider that there are sufficient differences of generic value to regard the genera *Protentomon* and *Proturentomon* as distinct.

The two genera will be differentiated thus.

Genus *Protentomon* Ewing

Proc. Ent. Soc. Washington *29* (9), 195, 1921: syn. *Meroentomon* Womersley, E.M.M. *63* 145, 1927; *Proturentomon* Bagnall (in part), Annals Mag. Nat. Hist. *17* (10) 210–212, 1936.

Dorsal abdominal apodemes absent. A single transverse row of setae on abdominal tergites.

Genotype *P. transitans* Ewing, 1921.

Genus *Proturentomon* Silv. 1909

Atti Acad. Naz. Lincei. Rend *18,* 7–10, 1909: syn. *Acerentulus* (auct. in part) *Paraentomon* Womersley, E.M.M. *63,* 145, 1927; *Proturentomon* Bagnall (in part) Annals Mag. Nat. Hist. *17* (10) 210–212, 1936.

Dorsal abdominal apodemes present. At least some abdominal tergites with two rows of setae.

Genotype *P. minimum* (Berlese 1908).

KEY TO THE KNOWN SPECIES OF PROTURENTOMON

1. Abdominal tergites VIII to I with an anterior row of 4 strong setae. *3*

   Abdominal tergites VIII to I with only 2 fine median setae in anterior row, occasionally these are absent on some tergites. *2*

2. Anterior setae absent on tergites VII to V. TR = 3.2. Length 585 μ. . . . . **P. iowaense** n. sp. Iowa, U. S. A.

   Anterior setae absent only on tergites VII. TR = 3.0. Length 900 μ (extended).

   P. clevedonense Womersley 1927, England.

   Anterior setae present on all tergites. TR = 3.0. Length 620 μ.

   P. minimum (Berlese 1908), Europe.

3. Sternite VII with 4 strong posterior setae, the median pair with 3 fine setae between them. TR = 3.1. Length 1760 μ (extended). . . . .*P. carpaticum* (Jonesco 1930), Roumania.

   Sternite VII with 6 strong posterior setae and one fine one on each side of median pair. TR = 3.66. Length 1240 μ.

   P. helenicum (Jonesco 1933), Greece.

Proturentomon iowaense sp. n.

(Fig. A–C)

Length 585 μ (extended). Head, anterior tarsi and apical abdominal segments fairly well chitinised and yellowish. Head shaped as figured, 67.5 μ long by 47.5 μ wide, pseudocelli small, 4 μ long. Leg I 147 μ long, tarsus provided with sensilla as in other species of the genus, 40 μ long, claw 12.5 μ long, TR = 3.2; leg II 75 μ long; leg III 82.5 μ. Abdominal appendages on I and II 2-segmented, 17.5 μ long, on III 1-segmented, shorter. Abdominal tergites chitinised towards apex. Chaetotaxy as figured: tergites with a subposterior row of 6 setae, VIII and IV to I also with 2 fine median anterior setae; sternites as figured. Abdominal segment VIII 57.5 μ long by 25 μ wide. Pectinal organ present on tergite VIII, but teeth indistinguishable. Thin and convex, but definite, abdominal apodemes present.

Locality. Columbus Jnt., Iowa, 26 September, 1932 (H. B. Mills).

Remarks. This species is the first of the genus to be recorded from America. It can be distinguished from all other species as in the key.

Family EOSENTOMIDAE Berlese 1909

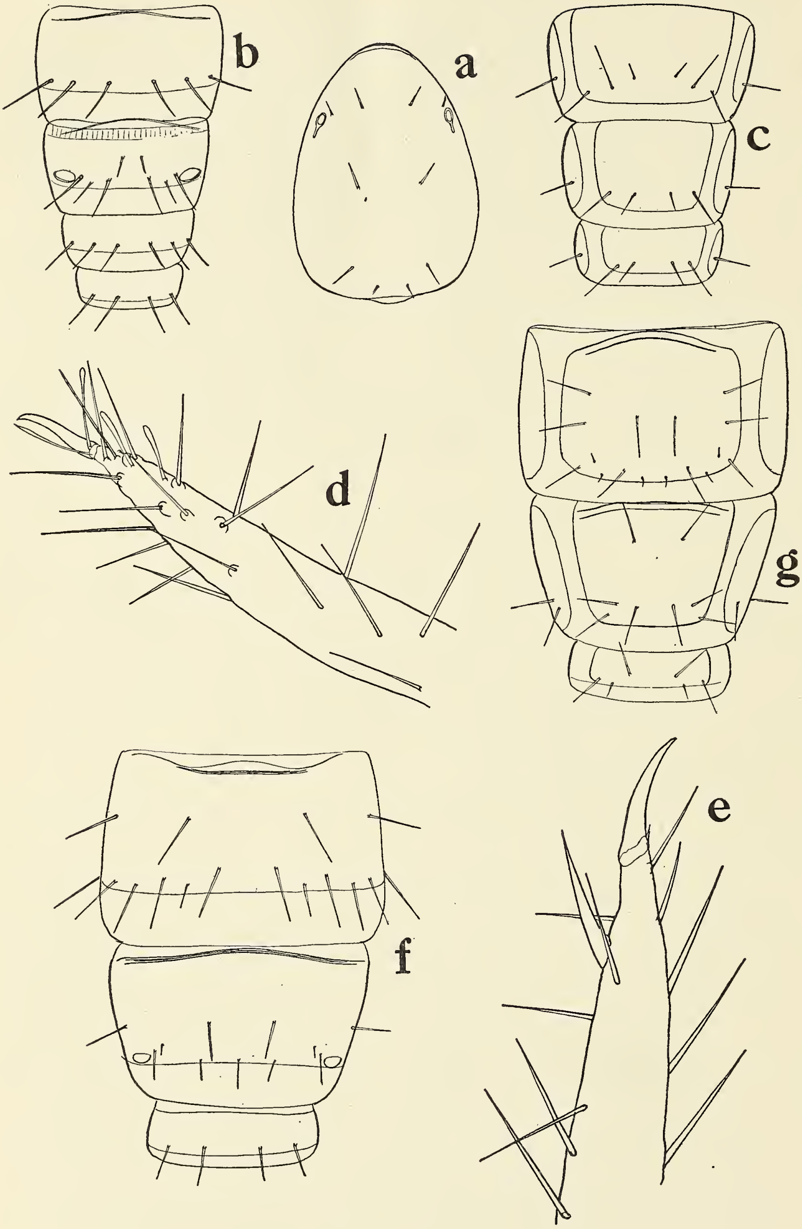
Genus *Eosentomon* Berlese 1909

Eosentomon millsi sp. n.

= *E. ?armatum* Mills 1932, Bull. Brooklyn Ent. Soc. *27*, 130 (nec Stach 1926)

Yellowish, well chitinised species belonging to the *armatum* group. Length 900 μ (extended 1350 μ). Head oval, 180 μ long by 120 μ broad. Pseudocelli 8 μ long. Legs I 285 μ, tarsus 89 μ, with empodium and clavate sensilla as in *armatum* Stach, claw S-shaped, 16.5 μ long, TR = 5.4; leg II 157 μ, claw evenly curved, 12.75 μ long; leg III 192 μ long, claw 15.75 μ; tarsus provided with a subapical strong spine as in *armatum*. Thoracic spiracles normal. Abdominal appendages on sternites I-III equal, 30 μ long by 26 μ wide. Chaetotaxy differing from *armatum* as follows: tergite VIII with median row of 4 long setae and irregular subposterior row of 7 short setae (cf. fig. F), VII with 4 median setae in a row, and 10 long ones subposteriorly (cf. fig. F) sternites VIII with anterior median row of 2 long setae and subposterior row of 7 long ones, VII with

Plate XII



anterior row of 4 long setae and subposterior row of 10 short and long ones, and laterally between each row another pair of long setae (cf. fig. G). In *armatum* Stach tergite VIII has a median row of 6 long setae and a subposterior row of 9 short setae.

Locality. Columbus Jnt., Iowa 26/9/30 (H.B.M. 5 specimens); Leon, Iowa, 10/10/33 (B. V. Travis, 3 spec. from moss); Maryana, Fla., 3/3/33 (H. B. M., in moss in numbers).

Remarks. Close to the European *E. armatum* Stach in the structure of the third tarsus, but differs in value of TR (5.0 in *armatum,* 5.4 in *millsi*), and the chaetotaxy of abdominal segments VII and VIII. The species is appreciatively dedicated to Prof. H. B. Mills. The record of *armatum* (Mills 1932) is probably the above species.

Explanation of Plate XII.

A–C. *Proturentomon iowaense* sp. n. a, head from above; b, tergites VII–X; c, sternites VII–IX.

D–G. *Eosentomon millsi* sp. n. d, tarsus of leg I; e, tarsus of leg III; f, tergites VII–IX; g, sternites VII–IX.

An Incidental Observation on Phototropism.—The reaction and response to light is a subject gaining in importance as a method in combating some insect pests. It is not a problem of particular concern to the writer, who merely wishes to place on record the following observations:

Street life in Seattle, Washington, had hardly abated at eleven o'clock on the night of June 26, 1938. The main thoroughfares in the heart of the city were ablaze with multicolors of light.

One of the stores, glaring in blue neon illumination, caused pedestrians to pause to brush themselves and to detour into the street. The disturbance was due to multitudes of moths of two species—a tent caterpillar (*Malacosoma*) and the Satin Moth (*Stilpnotia salicis.*) They were swarming about, settling on show windows, entrance, walls and on the sidewalks, including passers-by, Nothing within the sphere of the light escaped contact. Very few other moths or insects of other orders were represented. Continuing the observation, it was ascertained that lights of other colors—red, yellow, etc.—by comparison had an almost negative attraction.

The congestion of the Tent-caterpillar and Satin Moths at the blue neon light in the solidly built-up center of the city must have involved flights of considerable distances.

For some years the decreasing response of insects to ordinary lights is being reported. Possibly trap lanterns and other devices, when supplemented with blue filters, may be an improvement.—Geo. P. Engelhardt, Hartsdale, N. Y.

STUDIES IN THE ECOLOGY AND BEHAVIOR OF POLISTES WASPS.

By Phil Rau,
Kirkwood, Mo.

Among the social Hymenoptera, the ants and bees have attracted the attention of many able investigators. The study of the behavior and ecology of social wasps has, on the other hand, been greatly neglected. We do not need to look very far to explain this attitude; the work is, because of the usual inaccessibility of the nests, difficult to carry on, and also because of the real or fancied danger commonly associated with work of this kind. Two species of social wasps found in this part of the world cover their combs with several sheets of paper, making it impossible for the investigator to see what is going on inside the nest. Another disadvantage for the naturalist is that one species, *Vespa maculata,* builds high in the trees while the other, *Vespa germanica,* makes its nests underground. The Polistes wasps are, therefore, because of their open-faced nests, more easily accessible for study,—if the investigator is an adept at climbing over rafters in barns and other such obstacles. But even among Polistes wasps only three of the four species found here can be secured without trouble and inconvenience. These are: *Polistes variatus, Polistes annularis,* and *Polistes pallipes.* The fourth member of the group, *Polistes rubigenosis,* builds in hollow trees, and rarely crosses the path of the investigator. Any data one may acquire on this last species may be considered a windfall. *Annularis,* though a builder in trees, sometimes builds on low bushes, and sometimes even rears her home under eaves in rural buildings. *Pallipes,* having fully adapted herself to man-made structures, is more often seen; while *variatus,* usually dwelling near or in the earth, is frequently found constructing nests in these same buildings. If some of the notes seem incomplete, one must consider the difficulties under which observations on social wasps are made.

Swarming of Polistes Annularis in Temperate Regions.

In Panama I saw how *Polistes canadensis* var. *panamensis* swarms when the colony becomes too large. I have described elsewhere the breaking up of the colony and the subsequent founding of new colonies by small groups of these swarming wasps.[1] In the temperate regions a near relative, *Polistes annularis,* is found; so near, in fact, that Dr. Bequaert thinks it is a color variety of *canadensis.* In temperate regions swarming does not occur, but in its stead breaking up of the colony and hibernation takes place.[2]

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[1] Jungle Bees and Wasps of Barro Colorado Island. pp. 97–116, 1933.

For *Polistes annularis,* however, going into hibernation merely delays swarming, for in the spring wasps that have survived the winter come back to the home nest and renew friendships. Then it is that aggregations of few or many individuals swarm to nearby sites to commence nesting operations. The finding of *annularis* colonies in temperate regions wherein actual swarming occurs would do much to strengthen the theory that *annularis* in the north is really *canadensis* of the south. I was fortunate in locating on September 5, 1932, at Moselle, Missouri, a nest which must have had its inception in a manner identical with true swarming in the tropics. This colony, consisting of twelve adult wasps, was under the eaves of a barn; the nest had fifteen newly made shallow cells with very young larvae or with eggs. It was impossible for these adults to have emerged from the shallow cells; they had evidently come in a body from another colony and founded the new nest. These twelve wasps were, no doubt, a portion of a very strong colony under the same eaves only eight feet away. The latter nest was so overloaded with adults that many of them had to resort to piling themselves on top of another to obtain a foothold. With so much overcrowding it was natural for a portion of the population to congregate elsewhere, and, being industrious and of a sociable disposition, it was to be expected that they would stay together and carry on in a new location the nesting activities that were interrupted when they left the old home. One might reasonably suspect that swarming for *Polistes* in temperate regions, as we have seen it, is a vestigial instinct that appears only in times of great overcrowding.

SOUND PRODUCTION AND TROPHALLAXIS.

In a short paper entitled "Trophallaxis in *Polistes pallipes*"[3] I record the fact that for the purpose of inducing the flow of saliva in the larva, upon which the adults feed, the latter create certain sounds by rapidly vibrating the body against the open cells. Sound produced by this motion can be heard for several feet from the nest. Whether or not the larvae react to pure sound-waves or only to the vibration of the cell-walls during this process is not known, but whichever it is it has the power of inducing the larvae to spit up large globules of saliva. There are, however, some variations in the method of body-movement and in the sound that is created. Before recording my observations, I wish to review the method pursued by *pallipes* in the already mentioned paper. There I state that on two occasions an adult was heard to make a prolonged grating noise by rapidly moving the abdomen backwards and forwards against the open cells. On another occasion a wasp with her head at the opening and her antennae curved inside of a cell was rapidly beating it against the wall; her whole body was rhythmically in motion and appeared to actuate the head in the ramming process. These rapid movements of the head against the paper produced a strange sound. In one cell this drumming was repeated six times; and the duration of each round varied from one-fourth to one-half minute. After each trial the queen thrust her head into one of the cells.

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[2] Swarming, according to Dr. Wheeler (The Social Insects, pp. 224, 1928), does not occur in temperate regions, except in the honey bee and in certain ants (*Formica exsectoides*).

[3] Psyche, *35:* 153–156, 1928.

In recent years I have again seen, on several occasions, the same behavior in both orphan queens and real queens of *Polistes pallipes.* When so observed the behavior was of three kinds: first, by hammering the head against the edge of a cell; second, by moving the abdomen rapidly from side to side; third, by moving it forwards and backwards, brushing it, in all cases, against the edges of the open cells. I have also observed the same behavior on the part of several adults of *Polistes variatus.* In some cases, as in *pallipes,* the body would swing from side to side; in others it would move forwards and backwards with a jerkily rhythmical motion. In addition, the front legs would occasionally move forwards and backwards in the same rhythmical manner. All of these motions produced the same rasping sound as that recorded for *pallipes.* When one looks into the cells after such a rubbing, beads of saliva can be seen on the mouths of the larvae. The queens always poked their heads into the cells immediately on the cessation of their movements.

That adult wasps have other ways for obtaining the saliva was evidenced in the case of a *pallipes* worker on an orphan nest. When I handed her a half-grown larva of her own species, she chewed it into pulp for some time and it gradually became smaller as she swallowed portions of it. When the last speck (the size of a pin-head) remained, she carried it in open cells and placed it in the mouth of a larva where it immediately disappeared. This behavior seemed very silly at first but I soon discovered that this bit of meat, tiny as it was, set the salivary pumps of the larva in motion, and soon a big drop of juice made its appearance. The worker reentered the cell, drank it, and was well repaid for the crumb of flesh she gave up to prime the well of saliva.[4]

Male wasps also relish this saliva; I was surprised on another occasion to see a male dive into a cell and emerge with a glistening drop in his mouth, having stolen the saliva from a larva.

Communication among Polistes Wasps.

In observing *Polistes* wasps on the nest, one often notices a clashing of antennae between two individuals, and sometimes a wasp beating the abdomen of another with her antennae may be seen. On p. 233 of this paper, I describe the clashing of antennae between the two founding queens of one nest. Sometimes the movements of the palpi also give one the impression that they function in communication, especially when a returning wasp with a full crop of nectar shares it with others on the nest by mouth to mouth contact. Here the palpi of one wasp often come in contact with those of the other, in a way that indicates communication. Another action that seems to be a signal of some sort is seen when one approaches an *annularis* nest; the members of the population display their nervousness by tilting their abdomens slightly upward, and by standing high on the four hind legs while the two front ones vibrate rapidly with a scissor-like motion. The antennae are held rigidly horizontal during this behavior (Can. Ent., June 1930, pp. 119–120). The distal portions of antennae and parts of the legs are of a conspicuous orange-yellow color, and are in all likelihood a sufficient warning, when in motion, to frighten off any intruder. Since all of the wasps on a nest behave in this way, and since almost all of them act in unison, it seems probable that they are influenced by communication from one to another of some sort.

I have one record that appears to be sign-language; it is that of a worker *variatus* in the act of turning over to the queen a ball of caterpillar meat. The antennae of the worker is thrust out in a stiff manner as she approaches the queen; as the latter is about to receive the meat, she thrusts out her antennae in the same way. When the two pairs meet, they are held together for several seconds before the food changes places. This certainly means something in "wasp language," but just what it is I do not know.

The foregoing notes, while meagre in extent, indicate that communication occurs between adult and adult on the same nest. That there is also communication between adult and larva is indicated in the observations captioned "Sound Production and Tropholaxis."

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[4] She was a gluttonous creature, for a few minutes later she was seen to go to one cell and then another, obtaining and eating an egg from each.

HIBERNATION AND THE CLUSTER-POINT.

The point at which honeybees begin to cluster is 57° F.[5] I have often wished to know at what point *Polistes* wasps fall into a state of torpor during their pre-hibernation stage. My notes on the subject are as follows: On a warm day in March, 1930, I brought into the house three hibernating *annularis* queens. They were kept for about ten or twelve days in the living-room; then on March 19, they were taken into an unheated room with the temperature at 43° F. Next day they were found huddled close together in a state of torpor.

I have made several attempts to keep over-wintering wasps until spring (indoors as well as outdoors), but for some reason I have never fully succeeded in doing so. The best results were obtained with five adults brought in from Wickes, Missouri, on August 28, 1930. They were kept in an unheated room but died one on each of the following days: February 1, 8, 20, March 1, 15. In many other attempts, they all died before the end of the same year. One difficulty in making observations of this kind is that one does not know whether he is dealing with young queens or senescent workers, since there is no outward distinction between them. Also, one does not know if feeding when they are active on warm days is good or bad for them. The first part of this problem might be solved by dissection after the wasps die naturally; the second might be solved by keeping the wasps in a refrigerator during hibernation where they are not subjected to warm days and the consequent effects of occasional feeding.

PREPARATION FOR HIBERNATION.

Polistes wasps do not go into hibernation the moment they leave the nest in the autumn; they usually congregate in a more or less social manner at some point near the nest, where they may be seen at night or on cool mornings piled one upon another. I have recorded a few examples of this behavior[6] for *Polistes pallipes, Polistes rubigenosis,* and *Polistes annularis.* I found at that time that the exodus occurs during the day when the temperature is comparatively high, but it usually requires a previous spell of generally cooler weather to arouse in the wasps an inclination to come together.

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[5] Root, A B C and X Y Z of Bee Culture, p. 755, 1920.

[6] See "An additional note on the behavior of hibernating Polistes wasps, Ann. Ent. Soc. Amer., *24:* 515–518, 1931.

The additional notes that follow are not without interest: On one occasion during early August, five large orphan nests of *annularis* were pinned near to one another at the open door of my barn. The orphans that emerged took charge of their respective nests in the usual way and carried on the work. Toward the middle of August, each nest had a large number of adults; during the first week in September, however, I found that many of them had forsaken the nests, and slept night after night one on top of another in a corner of a window-frame ten feet away. Every night I saw from six to nine of them congregating in this corner; gradually the number increased until by September 13, sixteen of them were part of this pyramid-like structure. They finally failed to return and I suspect they found hibernating quarters elsewhere.

At the same time, September 1 to 10, the balance of the population on these five nests, numbering about 150 wasps, had congregated on two of the nests, having completely abandoned the other three. This aggregation has the earmarks of the swarming movements of *Polistes* in the tropics and it also shows that they love the company of one another, "even unto hibernation."

One wonders how the wasps know when to prepare for hibernation; by what uncanny means can they forecast the weather? When the temperature is low, it is too late for flight, and when it is high, they are reluctant to leave the sunshine. Do they sense the oncoming cold, and when the days are yet mild, go forth in search of hibernating places, or do they congregate in some favourable place and then send out scouts to find a location as do the swarms of honeybees?

TEMPORARY SHELTERS OF SITE-HUNTING QUEENS.

Even though the sun shone brightly on April 23, 1936, the day was cold and windy. The official temperature readings for that day at St. Louis, Missouri, were 37° minimum and 60° maximum with a mean temperature of 48° F. But at Glencoe, Missouri, where I studied *Polistes* queens that had sought temporary shelter, I am sure that it was much colder. *Polistes* wasps had evidently been site-hunting during the warm days previous to April 23, for on the nineteenth the maximum temperature was 70°, on the twentieth it was 89° and on the twenty-first, 74°. When the temperature fell to the maximum of 55° and a minimum of 33° on April 22, the site-hunting wasps sought temporary shelter from the cold. I found them in a hibernating condition when I examined a half dozen abandoned dwellings at Glencoe, Missouri. Ensconced in various niches in these ramshackle buildings were several hundred queens, cold and lethargic. Here about 100 *annularis* queens were found in two groups on old *annularis* nests in the corners of window-frames. On old *pallipes* nests, behind some loose sheets of wall-paper, and in corners of the window-sash, could be found smaller groups of closely huddled *variatus* and *pallipes* queens. Of the 250 to 300 queens observed, only three individuals were found in isolated positions. Among the *annularis* aggregations, I found no other species, but among the aggregations of *pallipes,* I often found a few queens of *variatus,* while among the aggregations of *variatus,* I often found a few queens of pallipes.[7] As expected, there were no males in any of these groups.

A few days earlier, on April 19, toward the close of day, I found at Grubvile, Mo., three such aggregations of *annularis* queens. These had come into a shed for shelter during the night. They probably spent the day in searching for nesting-sites. The nesting season for *polistes* wasps had just about begun, for in this shed I found three tiny nests, each presided over by a queen *variatus,* and each nest having three to six shallow cells.

Fraternizing among Polistes Wasps.

Social wasps are gregarious and *Polistes,* when without companions, often suffer much from loneliness. We only surmise this from their outward behavior. I record here certain observations that support this declaration.

A *pallipes* worker that I had marked as she emerged from an orphan nest, remained on the nest for a week and then disappeared; no others having emerged from the sealed cells up to that time. She was forgotten by me until about ten days later when I noticed her coming to my pond and carrying off gulletful after gulletful of water. Following her over the fence I discovered that she had been adopted by a small *pallipes* colony in my neighbor's shed. She proved to be an efficient worker and, in the new colony, had her craving for company satisfied.

On another occasion I watched a lonely *pallipes* queen for a few days and was surprised on May 17 to see three additional queens on the nest. As I came closer, two of them dropped to the ground. The original queen had been marked in white and one of the three strangers had an orange dot on the thorax. The latter had ruled over a nest fifteen inches away which, judging from its neglected condition, she had evidently deserted. I do not know from where the other two came. On another nest in the same barn on which I had left three marked queens the week before, I now found four queens; the new arrival, which was unmarked, dropped to the floor when I approached, while the original three clung tenaciously to the nest. (May 15th is too early in the season for the workers, so I am sure all were queens.)

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[7] These details are of importance in connection with observations on "The Instinct of Animosity of Queen Polistes," and are to be soon published in the *Journal of Comparative Psychology.*

In another group of farm buildings at Ranken, Mo., I found twenty-one *pallipes* nests, each with one queen, and one with two queens. I returned at night with a flashlight and examined all the nests. I again found one queen on each nest, except the one with two queens; here I now found four queens on the nest, and two nests nearby had none. In a fit of loneliness these two had deserted their own nests, and in a sympathetic way, the reigning queens permitted the lonely widows to remain.

Of course when a queen tolerates the visits of other queens, she is figuratively playing with fire, for it is easy for the visitor to drop her own eggs, cuckoo-bird fashion, into the nest of a sister-queen and thereby start the condition which we know as "social parasitism."

The fact that these visitors "enjoy" the company of others and make advances to obtain it, and also the fact that they are tolerantly received by reigning queens indicates that the gregarious instinct is so strong as to outweigh any antipathy they may sometimes have for one another at certain stages of colony-founding. There is only a short period in the life of a queen *pallipes* when she is alone and away from companions, and it is at a time in early spring when she is founding the nest; in youth she associates with sisters on the nest, her hibernating habits are gregarious, and in early summer she is in the company of her own daughters. Even for such short periods as the early stages of colony-founding, she can hardly bear to be alone, and we find her encouraging visits from other queens, or she herself often going out in quest of company. In certain species, such as *annularis,* the queen is almost never alone, since the nest-founding is often a cooperative venture, and this places her in the company of sister-queens, at the only time in her life when there is a possibility for her to be alone.

BEGINNING OF COLONY-FOUNDING.

I counted about 200 *pallipes* queens flying about the fishermen's shacks at Wickes, Missouri, on April 11, 1930. Although looking for nesting-sites, not one of them had settled down to the business of building. The only nest seen on that day belonged to a *variatus* queen, and it had six small cells, each with an egg. One half mile away, on the banks of the slough where last year many *annularis* nests were seen in the trees, I found not one new nest, but on several of the old nests, I found from fifteen to thirty-five queens each. They were clustered close together and occasionally additional queens joined those on the nests. At the stream below, several of the queens were filling their gullets with water and flying heavily to the old nests.

Referring to the large number of *pallipes* queens in the shacks, and the large number of *annularis* queens on the nests in the trees, I may state that the winter behavior of both is identical; both spend the winter in hibernation elsewhere, and both, when hibernation has been consummated, return to the old home site, the place of their birth and childhood. In addition to this, both species found their own colonies in the same general region of the old home.

Mid-April seems to be the approximate date (at least for the year 1930) for the commencement of nest-building by *polistes,* for on April 12 and 13 I noticed two *pallipes* queens and one *annularis* queen reconnoitering for nesting-sites about my premises at Kirkwood, and a few days later I discovered that all three had commenced to build there.

BEHAVIOR OF QUEENS WHEN TWO OR MORE ARE FOUNDRESSES OF A NEST

It is a difficult task to learn the relative importance of each queen when two or more are foundresses of one nest. Do all queens share equally in the work and in egg-laying or do some of them sink into the role of workers? Should we wish to further complicate the unraveling of this skein, we might ask if it is not likely that the overworked queen becomes sterile (ovarian castration), and is thereby reduced, physiologically, to a worker? These problems bear heavily on the unraveling of the tangled mesh of psychological and physiological evolution. Difficult as the problem is, it is worthy of much effort and study.

I have only a few notes on this subject: One *pallipes* nest that I observed at the beginning of the season, April 28, had three females in charge, and from that date to June 3, they continued to get along peaceably. At the earlier date the nest had 16 cells, and on May 27, it had 32 cells. A week later, on June 3, it still contained the same number of cells. These three queens were marked and observed from time to time; their reciprocal relations seemed to be practically the same as between one queen and two workers; one was constantly in charge, but the others would come and go at will. The observations seemed to indicate that the two females were vassals of the one that stayed on the nest and assumed the queenly duties. The queens would very often communicate with one another. One would deliberately walk up to another and administer a certain number of blows with her antennae on that of the listener. And too, one queen would often pose before the other and rapidly vibrate the forelegs in a scissor-like motion. This behavior certainly indicates communication; the acts were done with apparent deliberation and purpose. Long after the arrival of workers on the nests, these three marked wasps continued their harmonious cohabitation.

THE TIME SPENT ON THE NEST DURING ITS EARLY STAGES BY PALLIPES QUEENS

The day was warm and sunny on May 20, 1932, and I observed, along with some other work I was doing nearby, the comings and goings of queens on twelve nests. Some of them left the nest but once during the day; others as many as four or five times; none of them left the nest more than five times. All came in apparently empty handed; at least no building-pulp or caterpillar-meat was seen in their jaws. They may have brought in nectar, however, and placed it in the cells, for often a returning queen would poke her head into a cell and keep it there for several minutes.

THE SIZE OF ANNULARIS NESTS IN RELATION TO THE NUMBER OF QUEENS THAT FOUND THE COLONY

One notices much variation in the size of *annularis* nests. Sometimes at the end of the season, they are quite small; sometimes quite large. The size of the nest is in proportion to the number of queens that found it. Colonies with only one queen have small nests; those with many queens have large nests. The largest nest I have seen of this species was one exhibited in a store at Allenton, Missouri; I knew it to be of this species by the position of the pedicle. It measured 11 × 11 inches and contained 1936 cells. The normal size of the nest is probably very much like that of four nests which I took on low bushes at Ranken, Missouri. It was almost at the end of the season (August 10), and the nests contained 268, 277, 287, and 292 cells respectively. But no one knows how many queens had a hand in the founding of these nests.[8]

That there is a very definite correlation between the size of the nest and the number of founding queens is proven by the following data gathered early in the year before the workers were born.

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[8] Pierce (Bull. U. S. Nat. Mus., No. 66, 17, 1909) took two *annularis* nests in Texas; one had 1575 cells and the other had 1212 cells.

Date	Location	No. Nests Observed	Numbers of Nests with—			
			1 Queen	2 Queens	3 Queens	4 Queens
5/5/30	Sullivan, Mo.	3	12 cells	23 cells		90 cells
5/9/30	Cliff Cave, Mo.	3		32 cells	40 cells	45 cells
4/20/32	Weingarten, Mo.	8	4, 6, 6, 9, 9 cells	19, 20 cells		38 cells

Thus we see, at least early in the year, that two queens on a nest will, on an average, more than double the cell production over those with one queen, and four queens on a nest will often quadruple it.

The work of cell building for this and other species of *Polistes* does not go on indefinitely; the period comes, at one time or another, when building operations stop and attention is directed to the feeding and nursing of the young. I was able to note the amount of cell building done between June 13 and July 6 by one colony that had three queens. On June 13, the nest had 35 cells with larvae or eggs, and 9 sealed cells with pupae, making a total of forty-four cells. On July 6, after a period of about twenty-three days, when I counted them, I found eighty-five cells with eggs or larvae and seventeen cells with pupae, making a total of 102 cells; thus showing that queens and workers were responsible for making fifty-eight cells during that period. I might say in passing (even though this fact has nothing to do with nest building) that in the twelve big empty cells in the center of the nest (from which workers had recently emerged), I found each one supplied with an egg, thus confirming previous records that certain cells (especially the original ones) are used more than once for young.

THE SIZE OF PALLIPES NESTS IN RELATION TO THE NUMBER OF QUEENS THAT FOUND THE COLONY.

Often several queens cooperate in the founding of *annularis* colonies, but it is only on rare occasions that one finds a nest of *pallipes* founded by more than one queen. Finding a nest with two queens gave me an opportunity to compare the growth of a nest with two queens with that of nests having only one queen. The table below gives the data on the amount of work done by each of twenty-two queens on twenty-two nests, and also the work done by two queens on one nest.

Date.	Location.	No. Nests Observed.	Number of Cells.								
			6	8	10	12	14	16	18	20	50
5/5	Sullivan, Mo.	1 queen each on 6 nests.	1		1	1	1	1	1		
5/18	Ranken, Mo.	1 queen each on 16 nests.		2	2	3	4	2	2	1	
5/18	Ranken, Mo.	2 queens on 1 nest									1

Here we see that nests with one queen had, on these dates, from six to twenty cells; and that one nest with two queens had fifty cells, the latter pair working alone, and doing, therefore, about three times as much work as the average queen. This indicates that both wasps did the manual labor and that this project is truly a cooperative venture; for if one wasp was vassal and the other a non-working queen, I doubt if so much work would have been accomplished.

(*To be continued*)

Notes on Preparation Technique.—I find that by cross-ruling a sheet of fine stiff paper with a broad lettering pen (such as a C-4 Speedball) and then cutting along the middle of the lines produces neat determination labels in short order. I make my labels 10 x 20 cm.

It does not seem to be generally known that immersion in xylol will nicely degrease specimens. A lightly greased specimen will be put in fine shaps in a few minutes without matting hairs. The liquid may be used repeatedly for some time, and has no effect on pointed specimens glued with acetic gelatin. Nor is it generally known that concentrated ammonia water applied with a pointed brush will quickly relax specimens in order to move a part obscuring necessary characters, etc. I use the ammonia applied to the whole insect to relax the hypopygium of Diptera. I wet the fly and put it in a relaxing chamber for about a half hour, which is usually sufficient.—George Steyskal, Detroit, Mich.

TWO NEW SPECIES OF BROCHYMENA (PENTATOMIDAE, HETEROPTERA) FROM ARIZONA.

By Herbert Ruckes,
College of the City of New York, New York City.

During the season of 1937 the author had the opportunity to collect at a number of known stations in Arizona and New Mexico. One of the richest places yet found is the Santa Rita Range in Santa Cruz County just south of Tucson; here a number of day's collecting was done in the company of Mr. J. R. de la Torre-Bueno, to whom thanks are due for guidance through this relatively wild country. During this period two very distinctly new species of *Brochymena* turned up. To be sure they appeared in small numbers but their characters are so distinct that there can be no question as to their validity as new species. One of these I am naming *Brochymena lineata* and the other *B. dilata*. Dr. Ball of the University of Arizona has been kind enough to give me two additional specimens of the first of these two species; he states that he procured these from the trunks of the southwestern white-leaf oak *Quercus hypoleuca* Engelm. in the vicinity of Sonoita and Williamson's Valley. The name *B. lineata* is applied to this species because there are at least two very distinct ivory white or pale testaceous narrow bands running over the posterior half of the pronotum and basal corners of the scutellum. The name *B. dilata* is given to the second species on two counts, first because the abdomen is expanded laterally more so than in other species of the genus giving an almost orbicular outline to the body and secondly because in the male there are two ventrally and medially dilated lobes on the genital cup.

Since writing the following descriptions I have had the pleasure of examining species of *Brochymena* in the collections of the United States National Museum and Mr. H. G. Barber of that museum's staff. I can report that in the National Museum collection there are six specimens of *B. dilata* and one of *B. lineata,* while in Mr. Barber's personal collection I found two specimens of each species.

Brochymena lineata n. sp.

Form elliptical; neither conspicuously depressed nor convex, dorsally or ventrally; color in general aspect pale, being a mixture of ivory, testaceous, fuscous and black; punctures varying from minute ferruginous pin-point dots to deep, corroded black pits, the latter disposed in broad bands on the pronotum and scutellum. Head testaceous; disc between the eyes somewhat convex, in front of them gradually undulating and flattened; diameter behind the eyes just about equal to that in front of them so that eyes appear to protrude; sides of head from eyes to subapical teeth feebly converging, very nearly parallel, their edges weakly concave; subapical teeth in female small and rectangular to obtuse, in male more obtuse and less conspicuous; juga converge to an acute apex; diameter across subapical teeth about three times as long as distance between that line and apex of head; punctures mostly ferruginous, some nigro-fuscous ones found at base of tylus and surrounding area. Edge of bucculae strongly sinuate and ending anteriorly in a very prominent, latero-divergent, acute tooth; the edges of the bucculae and margins of the juga, at least in the females, ivory and smooth, in the males testaceous. First and second antennal segments reddish-fuscous, others deeper fuscous to piceous; *the basal fifth of segment four distinctly flattened or compressed and more smooth than the remaining portion of the segment;* segments two to five subequal in length, with segment five shortest; in one male specimen segment two is distinctly longer than the others. Median length of the pronotum equal to that of head; diameter across humeri about one sixth greater than median length; disc irregularly undulating with a median, weak, ivory or pale carina on front half; the carina becomes obsolete on hind half; *two prominent smooth ivory colored, irregular, longitudinal bars on posterior half,* each one about midway between the midline and the respective humerus; between the carina and each of these ivory bands appears a *broadish subrectangular area of large deep, corroded pits, nigro-fuscous to piceous,* some of these having smooth ivory or pale borders; several shallowly depressed or excavated areas on disc; calli somewhat raised and irregularly smooth; edges of pronotum weakly convex-arcuate bearing six to eight ivory, conical teeth which blend with the dull yellow edge of the disc; humeri subtriangular, slightly tumid, the edges with four or five retrorse serrations. Propleuron with an arcuate sulcus just underneath the margin of pronotum; this sulcus subtended by a punctured area, at least no appreciable amount of smooth showing; the punctures more or less evenly distributed and of medium size; propleuron becoming darker laterally toward sulcus and paler toward coxal region; the sulcus appears as a dark fuscous groove. Scutellum long and narrow for this genus; basal third somewhat tumid with a broadish median carina continued to apical third; basal angles in the form of deep, corroded, nigro-fuscous pits; *mediad to these a short ivory or pale bar, impunctate and continuous with the similar one on the pronotum; this pale bar followed medially by a broad, rugose band of nigro-fuscous pits which extend posterior to the claval edge of scutellum;* this area in turn followed medially by a very irregular longitudinal pale stripe that becomes punctured with ferruginous and fuscous pits toward the inner edge; apical third of scutellum paler, with smooth areas becoming larger; the scutellar carina with an irregular row of large fuscous punctures. Elytra pale to testaceous with *very uniform fuscous punctures evenly distributed* and tending to coalesce toward the apical end; the highest point on the elytra usually impunctate and pale. Membrane clear with rich ferruginous vermiculate and arborescent markings. Edges of the abdomen not excessively explanate, rather less so than is common for this genus, the outline being elliptical and the abdomen somewhat tapering posteriorly; greatest width of the entire body across humeri; *greatest width of abdomen distinctly less than that* across humeri; abdomen alternated with testaceous and fuscous, the narrow band each side of the incisure being testaceous. The venter bright testaceous with incisures between segments distinctly dark fuscous, as are also the stigmata, a thin line behind them and a smooth spot near them; punctures on the venter are of medium size, fuscous to reddish and irregularly scattered, tending to concentrate laterally; sixth ventral of the female with five to seven fuscous blotches, one median and two or three laterally across segment; basal valves of female genital plates with an inner border of fuscous or dark. Femora dull testaceous with fuscous maculations arranged in longitudinal vittae which coalesce distally and there interrupted by a partially complete pale annulus; tibiae conspicuously annulated; the exterior surface of the pale band with a small dark blotch, smallest on the fore tibia and becoming increasingly larger on the middle and hind. Proximal two joints of the tarsi distinctly pale above, otherwise fuscous; claws and remaining joint fuscous. Beak reaching past the middle of the third ventral. Metasternal osteole and canal small though conspicuous because of contrasting color; osteolar cone and crater ivory or very pale, auricle deep fuscous almost piceous, narrowed at base and spatulate distally; evaporating area small, its lateral edge cutting obliquely across the surrounding disc, area pale, testaceous; surrounding regions darker. Male genital cup small for this genus, *rounded, without any conspicuous outgrowths*

> *or lateral expansions;* the lateral corners do not reach even close to the ends of the sixth ventral segment; posterior edge across cup, excluding a shallow median excavation, provided with a very shallow, obsolescent sulcus; pubescence very short and fine, not silky; proctiger very wide and testaceous-fuscous to fuscous; claspers almost piceous and smallish.

Holotype: Female, Patagonia, Sonoita Creek, Santa Cruz Co., Ariz. 7/23/37. Collection of the American Museum of Natural History.

Allotype: Male, Patagonia, Sonoita Creek, Santa Cruz Co., Ariz. 7/23/37. Collection of author.

Paratypes: one female Williamson Valley (E. D. Ball, 6/22/35); one female, Fort Wingate, N. M., 3/15/08, the latter in the collection of the Academy of Natural Sciences of Philadelphia.

B. lineata appears to be related to *B. cariosa* Stål. It differs from the latter however in the following respects: *B. lineata* has much finer and more even punctation and less contrasting markings except for the white lines on the thorax and scutellum; the specimen is, on the whole, somewhat more elliptical, *i.e.,* proportionately slightly longer in relation to its width and lighter and more gray in general color. The two species are alike in the shapes of their heads and the relative lengths of their antennal segments, with segment two being somewhat longer than segment three in both species; the male genital cup of *B. cariosa* is similar to that of *B. lineata* but is larger and coarser in all aspects.

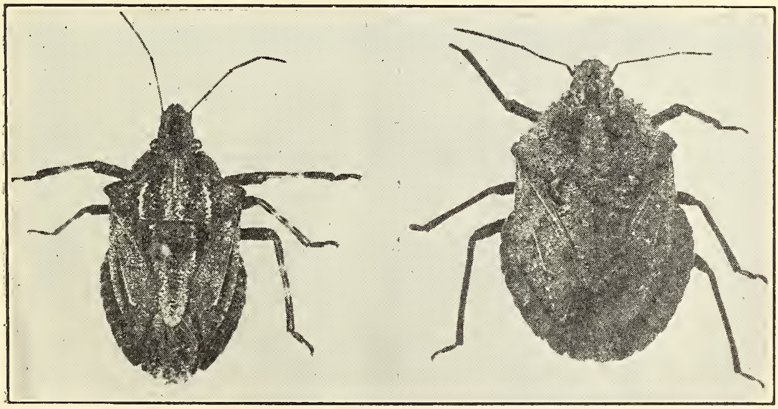
Brochymena dilata n. sp.

> Form broadly oval, somewhat depressed on top and slightly convex beneath; dorsal surface at least not as convex as in allied species; color in general aspect somewhat cinereous, being a mixture of a dull testaceous background mixed with fuscous and blackish punctures of various sizes, each of the smaller ones provided with a whitish bloom. Head more reddish than testaceous; diameter behind the eyes much less than just in front of them, disc widest just in front of eyes and then sides slightly converging to an evenly obtuse, arcuate apex in the female, and a slightly more truncated one in the male; diameter across subapical teeth about four times the distance between that line and apex of head; juga as long as tylus with their tips not touching; edges in front of eyes somewhat sinuconcave, these edges and those of the juga finely and irregularly creno-serrulate, at least not smooth; apical tooth not con-

spicuous and tending to be blunt, not acutely angled. Edge of the bucculae deeply sinuate and ending anteriorly in an acute prominent tooth that meets the blunt, rounded ventral extension of the gena in an inconspicuous angle. *Basal three segments of antennae reddish, distal two much darker, almost piceous;* segments two to five subequal, at least none conspicuously longer or shorter than another. Median length of pronotum as long as that of head; diameter across humeri about one seventh greater than the median length; disc around the calli somewhat tumid in two raised areas leaving a shallow median rectilinear portion excavated; two lateral obscurely circular areas also excavated, these about equidistant from front and hind margins of pronotum but closer to lateral edge than median line; some scattered large piceous pits on pronotal disc, these forming, however, *no definite pattern; small punctures numerous and very evenly distributed* reaching the very bases of the marginal teeth. Marginal teeth seven to nine in number, *bluntly rounded, uniform in size, perceptibly flattened, never conical or terete,* sometimes with denticules at their bases; teeth either concolorous with disc of pronotum or paler, never darker; *teeth tend to point backwards;* humeri subtriangular with irregular small serrations becoming obsolete posteriorly. Propleuron with an arcuate sulcus just below the pronotal margin; *area around sulcus appreciably smooth and concolorous with remaining disc;* rest of propleuron and prosternum with scattered coarse fuscous or reddish fuscous punctures. *Elytra with numerous substellate points and blotches,* these impunctate and pale and evenly distributed over elytra. Scutellum with a *few widely scattered large punctures,* these concentrated at the basal angles to form two small corroded areas. Edges of the abdomen *explanate and extend well beyond the costal margin* of the elytra and in the female at least form an almost *orbicular outline* to the body; *lateral diameter across widest part of abdomen at least one sixth greater than width across humeri;* exposed edge of abdomen *not* brightly colored and *inconspicuously* alternated. Venter testaceous to reddish-fuscous with many punctures of various sizes scattered irregularly; sparsely clothed with an inconspicuous tomentum. Femora with maculations arranged in incomplete longitudinal vittae which terminate in a distal irregular piceous area which is broken medially by a rectilinear pale blotch; *tibiae distinctly reddish to reddish-fuscous and without annuli or maculations of any kind;* tibiae more slender and more uniform in diameter than in related species; the sulcate face slightly darker than posterior surface; tarsi and claws fuscous. *Male genital cup with lateral wings conspicuously protruding ventrally and medially,* not laterally, into a pair of thickish, darker, rounded lobes, the dorsal surface of which is clothed with short soft hairs; exposed face (medial aspect) of dorsal ramus of claspers semicircular in outline and piceous in color, shining; proctiger broad and deep fuscous with a paler reddish median stripe. Membrane with veins strikingly fuscous on an obscurely milky-hyaline background. Basal valves of female plates somewhat convex, at least more so than in allied species; the distal valves not reaching the edge of the eighth tergite; median plate of valves broadly triangular with a concave posterior edge. Auricle of the metasternal canal elongated, tongue-shaped, narrowed at the base and several times as long as the external diameter of the orifice; the auricle has a partial spiral twist to it; the evaporating area and the crateriform region of the base of the orifice are not conspicuously different in color from the surrounding area.

Holotype: Female, White House Canyon, Santa Rita Mts., Santa Cruz Co., Ariz., 7/21/37 Coll. H. Ruckes deposited in American Museum of Natural History. Allotype: Male, Ditto in author's collection. Paratype: One female also in author's collection.

In one male specimen in the collection of the National Museum (U. S.) I have observed that the fore tibiae are not immaculate as stated in the above but are provided with an obscure and incomplete pale annulus near the knee.



Brochymena lineata, n. sp.

Brochymena dilata, n. sp.

B. dilata in appearance has the facies of *B. carolinensis* (West.) but has a much more explanate abdominal edge and much less prominent shoulder; the basal three antennal segments are much more reddish in *B. dilata* and contrast more with the two much darker distal ones; the exaporating area is not impressed in its metasternal disc as in *B. carolinensis* and the auricle of the orifice is several times larger than in that species; the marginal teeth of the pronotum are much more blunt and retrorse than in *B. carolinensis*. It is in the structure of the male genital cup that this species (*B. dilata*) is unique; no other species that I have examined has the lateral lobes protruding and dilated as in this one.

HISTER CILIATUS RECORDED FROM ARIZONA.
(Coleoptera—Histeridae).

By Charles A. Ballou Jr. and Carl Geo. Siepmann.

Hister ciliatus was described by Lewis (1888—Biologia Centrali Americana, Coleoptera vol. 2, pt. 1, p. 199) from four specimens taken by Sallé in Guanajuato, Mexico. This seems to be the only published record of this species.

It is represented in our collection by 18 specimens collected by Mr. Howard E. Hinton at Tejupilco, D. F., Mexico, in July 1932, and 4 specimens collected by Mr. A. A. Nichol at Tucson, Arizona, January 12, 1928. The Arizona specimens are a new record for the United States.

Although the genus Hister is large, the species *ciliatus* is easily recognized. It is entirely black in color, and the sides of the prothorax are ciliate beneath. With the possible exception noted below, only one other North American species—*Hister laevipes*—possesses these two characters in combination. A number of species of *Hister* occur in North America with the sides of the prothorax ciliate beneath, but they have red and black elytra—these constitute the "group *arcuatus*" of Horn or the subgenus *Spilodiscus* of Lewis. The following brief diagnoses will serve both to identify and distinguish *ciliatus* and *laevipes*.

Hister laevipes Lec.

Thorax with inner lateral stria entire, outer lateral stria abbreviated behind, usually extending to about the middle, rarely almost as long as the inner stria. First three elytral striae entire, 4th very short, basal; 5th absent. Sutural stria almost entire. Inner subhumeral stria deep and distinct on apical half, absent on basal half. Pygidium practically without punctures, sometimes a few small punctures at basal angles or along basal margin. Prosternal lobe broadly rounded in front. Anterior tibiae triangular, without external teeth. Size extremely variable, length 3.5–6.5 mm.

Specimens in our collection from N. Y., N. C., S. C., Ga., Fla., Ala., and Miss. Marseul (1853, Monograph p. 234) records it from Mexico and Brazil.

Hister ciliatus Lewis.

Thorax with inner lateral stria entire, outer lateral stria abbreviated behind, at most extending to the middle, and sometimes consisting only of a short apical line. First four elytral striae entire, 5th short and apical. Sutural stria moderately long, slightly abbreviated at each end. Inner subhumeral stria absent. Pygidium rather coarsely, closely, deeply and uniformly punctured. Prosternal lobe acute in front. Anterior tibiae with three broad, shallow but distinct teeth. Length 4–6 mm.

Arizona, Mexico.

The acute prosternal lobe in *ciliatus* is not mentioned in Lewis's description, but it is a good character and does not occur in many species of *Hister.* In this connection, attention should be called to *Hister* (*Spilodiscus*) *gloveri* Horn, the most outstanding character of which is the acute prosternal lobe. Like the two species under discussion, it has the sides of the prothorax ciliate beneath. The type is said to be entirely black in color, but Horn associated with it a specimen having red and black elytra. *Gloveri* apparently has not turned up in collections recently. It was unknown to Casey, and it is unknown to us. Casey suggested that a saturation with exuded grease will obscure the coloration, and that *gloveri* possibly may not be an all-black species at all. *Gloveri,* at any rate, differs from both *laevipes* and *ciliatus* in many respects, including pronotum with two entire striae, elytra with only three entire discal striae and a short sutural, anterior tibiae with the two large teeth characteristic of *Spilodiscus.*

The specimens of *ciliatus* taken by Mr. Hinton in Mexico were associated with an unidentified ant.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

BUY OR EXCHANGE: Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, College of the City of New York, New York City.

EXCHANGE OR FOR SALE.—*Catocala herodias* (Gerhardi), *Graptolitha viridipallens* and others. Wanted: Rare N. A. Macro-Lepidoptera. F. Lemmer, Lakehurst, N. J.

WANTED.—North American CHRYSIDIDAE for exchange or determination, with privilege of retaining duplicates. W. G. Bodenstein, Dept. Entomology, Cornell University, Ithaca, New York.

PENTATOMIDAE: Want to buy or exchange Petatomidae from the United States and Mexico. Herbert Ruckes, College of the City of New York, 17 Lexington Ave. N.Y.C.

LOCALITY LABELS—5 in strip, 1 to 3 lines. 75c per thousand. Pamphlet price list, samples upon request. Any size type. 3½ point, $1.00 per thousand. George F. Michels, Printing—604 Hollenbeck St., Rochester, N. Y.

ACALYPTRATE DIPTERA OF THE WORLD wanted for determination or in exchange for other insects. Geo. Steyskal, 23341 Puritan Ave., Detroit, Mich.

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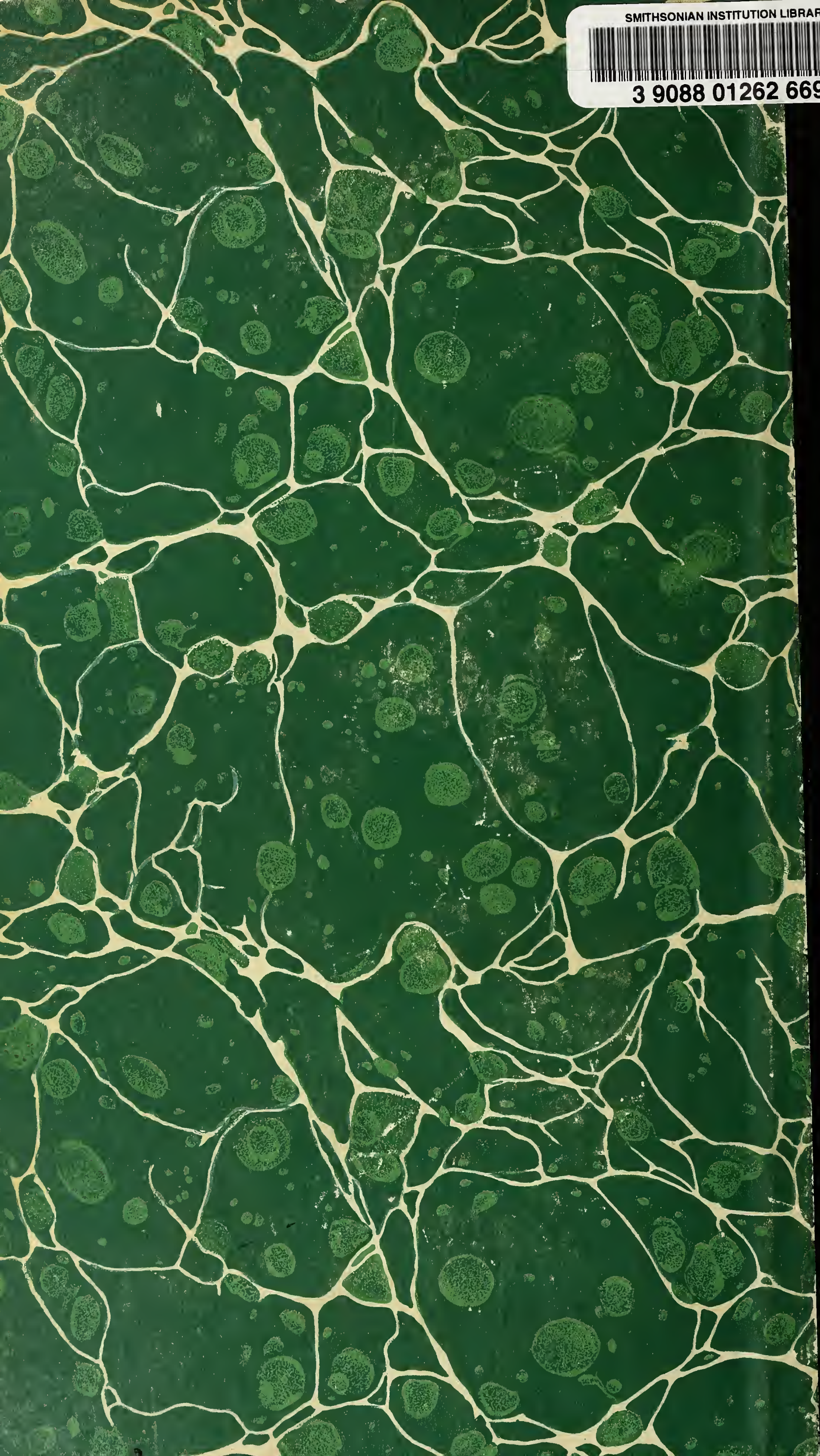

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